The Bee Genera

of North and Central America (Hymenoptera: Apoidea)

Charles D. Michener, Ronald J. McGinley, and Bryan N. Danforth

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For years entomologists, ecologists, and botanists interested in pollination problems have urged bee specialists to prepare a key for identifying bee genera in North and Central America. Although regional keys exist, this extensively field-tested reference is the first to facilitate identification to the genus level of bees throughout the Northern (American) Hemisphere. More than 500 drawings and photographs illustrate nearly every step in this key to the 169 genera, with text in both English and Spanish.

In the introduction, the authors describe how researchers already familiar with bee genera can streamline their use of the keys. Along with the comprehensive classification and discussion of features, the authors also provide practical advice to students embarking on their first attempts at bee identification. The notes on each genus give its range (for North and Central America), number of species, references to any revisional studies, subgenera, if any, and distinguishing features. The book indicates nest sites for those bees that do not nest in the ground and identifies hosts for socially parasitic and cleptoparasitic genera. The authors list changes in classification and nomenclature and summarize the current classification by genera and subgenera.

The Bee Genera of North and Central America offers in one convenient volume an unprecedented compendium for entomologists, ecologists, beekeepers, and scientists involved in pollination studies.

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Habitus (whole animal) drawings were done by the following artists:
Elaine R. S. Hodges: cover, frontispiece, chapter opening pages, and figs. 417, 429, 441, 442, 459, 465, 477, 480, 493, 497, 505.
Natalia A. Florenskaya: fig. 428.
Celeste Green: figs. 491, 495.
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Contents

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Three groups used the keys extensively and recommended various improvements. They were classes on bees given by G. C. Eickwort in the spring of 1989 at Cornell University and by B. Alexander in the spring of 1991 at the University of Kansas, and a two-week PCAM workshop on bees, sponsored by the Smithsonian Institution and the Universidad Nacional Autónomo de México (UNAM) and held in July 1989 at the Chamela field station of UNAM. We appreciate the hard work and the helpfulness of all three of these groups. T. L. Griswold and D. Yanega also used the keys extensively and found various places where modifications were needed to accommodate certain species. Griswold also made available his lists of species known from Mesoamerica, which were useful in preparing the section "Notes on the Genera." T. L. Griswold and R. R. Snelling reviewed the final draft and made valuable suggestions.

Parts of the keys are modified from published keys, particularly those of LaBerge (1957) on Eucerini, Snelling and Brooks (1985) on Ericrocidini, and Roberts and Brooks (1987) on the *Agapostemon* group. Manuscript material or preliminary keys were also provided in some

cases. In this way L. Ruz and J. G. Rozen, Jr., helped with the part on panurgine genera, F. D. Parker and T. L. Griswold provided materials for the part on relatives of *Stelis,* and Griswold helped with the osmiine megachilids. Griswold also provided us with records of many unpublished range extensions for Mexico and Central America, based on specimens at Utah State University.

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The Spanish versions of the keys were prepared by A. Roig-Alsina, to whom we are much indebted. R. Ayala and P. Gentili also contributed to the translation.

Illustrations were mostly prepared by E. R. S. Hodges, based on specimens and on sketches by RJM and BND. We are grateful to K. Marsh, N. Florenskaya, A. Roig-Alsina, and D. J. Brothers for the final preparation of some figures. We also thank authors who allowed us to redraw or photograph previously published figures. Scanning electron photomicrographs were prepared by BND with the help of S. Braden of the Scanning Electron Microscope Lab, National Museum of Natural History. For other photos we thank V. E. Krantz of the Smithsonian Office of Printing and Photographic Services. Appendix B provides details on the sources of all figures.

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The Bee Genera of North and Central America

Introduction

For years entomologists, ecologists, botanists interested in pollination problems, and others have urged the preparation of a key to facilitate identification of genera of bees in North and Central America. Bee specialists, finding such identification relatively easy for them, have not hitherto provided such a key, although certain regional accounts and keys exist: Michener (1944—key to genera found north of Mexico); Mitchell (1960, 1962—eastern United States and Canada); Stephen, Bohart, and Torchio (1969—northwestern United States); Michener (1954a—Panama); and Ayala (1988—Chamela, Mexico).

As a step to promote studies of Mexican bees in Mexico, the Programa Cooperativo sobre la Apifauna Mexicana (PCAM) was initiated in 1985. An obvious need was a key for identification of Mexican genera for persons not thoroughly familiar with bees, and we undertook to prepare one. It soon became clear that few genera are found in the United States and Canada that do not also occur, or probably occur, in Mexico. The list of such genera is as follows: *Cemolobus, Epeoloides, Macropis*. By adding these genera to the key to Mexican genera, we expanded the area of coverage to the whole of North America.

A few additional genera, not known from Mexico, occur in Central America (Panama to Guatemala) and the Antilles. We have added them to the key, so that one should be able to identify to genus any bee known from north of the Colombia-Panama border. A total of 169 genera are recognized; probably additional South American genera will be found with more collecting in Central America and even southern Mexico. The key should be useful, however, throughout moist tropical America—for example, in the Amazon Valley. On the other hand, temperate South America, the Andes, and xeric areas like northeastern Brazil have quite different bee faunas. To encourage study of bees in Latin America, we have included Spanish translations of the keys.

We follow current custom in recognizing several families of bees, most of them divided into subfamilies and tribes. In view of the close relationship of bees and sphe-

coid wasps, we place both groups in a single superfamily (to be called Apoidea; see Michener 1986a), with all bees in an informal group called the apiformes (Brothers 1975:587). One of us (CDM) is in the midst of a restudy of the higher classification of bees (see Appendix D); we have been conservative, therefore, in proposing major changes that might turn out to be premature.

In a few cases, nevertheless, we have made minor classificatory changes or accepted a view that may have been published but is not yet widely followed. Such matters are explained briefly in "Notes on the Genera," and a list of names having a new or not generally accepted status is provided in the section "Classificatory and Nomenclatural Changes."

The classificatory changes are generally intended to make genera somehow equivalent in various groups of bees. Although many people agree that this is a desirable goal, there is no practical and objective way, nor widely accepted criterion, for measuring equivalence in a large study such as this. Nevertheless one can subjectively say that the genera differ by less conspicuous and less numerous features—and are therefore more difficult to distinguish—in some groups, such as Eucerini and Augochlorini, than in other groups. It has not been practical to modify this situation here. We have in general taken the view, widespread and old but not universal among bee specialists, that a moderate number of large, readily distinguishable genera is preferable to a large number of small genera. Thus genera like *Culex, Aedes, Drosophila,* and *Andrena* mean something to many biologists. Each such genus could be split merely by raising subgenera to generic status, but usefulness to a broad audience argues against that action.

As a tool for practical identification, the keys and accompanying "Notes on the Genera" are not the places for cladistic or other major new classificatory work. As indicated above, such studies are going on. For the present, we have taken the genera as they stand (except for a few changes that seem needed) and tried to make them relatively easily identifiable. Some are almost surely paraphyletic, which for some workers but not others necessitates a change. In the absence of soundly based phylogenies for most groups, we have delayed discussion of such problems.

Our objective here being to facilitate generic identification, we have not attempted to provide an introduction to the many studies on nesting behavior and floral biology of bees. For an overview of such topics, we recommend O'Toole and Raw (1991). For references to the primary literature on the taxonomy, behavior, and ecology of bees north of Mexico, see Hurd (1979); primary literature for the family Halictidae of the Western Hemisphere can be found in Moure and Hurd (1987). Roubik (1989) provides a recent account of tropical bee biology. All these sources provide references on social behavior and can be supplemented by Michener (1974) and chapters in Engels (1990). References to works on bee larvae are provided by McGinley (1989).

All three authors have used and improved all parts of this work. CDM prepared the original versions of all the keys and "Notes on the Genera" and arranged for most of the wing drawings. RJM and BND prepared or supervised preparation of nearly all the other drawings and photographs, contributed to the improvement of the keys, and were entirely responsible for arranging the text and illustrations and correlating the interlocking parts of the work.

How to Recognize a Bee

Bees constitute a monophyletic group of aculeate Hymenoptera (bees, ants, and wasps). The superfamily Apoidea (formerly called Sphecoidea, but see Michener 1986a), which includes bees and sphecoid wasps, can be recognized by a number of characters, of which the following two are the strongest: (1) The pronotal lobe [Fig. 13] is distinct but rather small, usually well separated from and below the tegula. (2) The pronotum is extended ventrolaterally as processes that encircle or nearly encircle the thorax behind the forecoxae.

The Apoidea is divisible into two groups: the sphecoid wasps, or spheciformes, and the bees, or apiformes (Brothers 1975). The bees, which are believed to have arisen from the paraphyletic spheciformes, have abandoned the ancestral predatory habit of feeding larvae on insect or spider prey. Instead they use pollen as the principal protein source for their larvae; the pollen is mixed with nectar or honey, or sometimes with floral oils or with

glandular products of adults. (Although some meliponine bees use carrion as a protein source, and some bees eat eggs of others, bees are almost exclusively phytophagous.)

In general, bees are more robust and hairy than wasps, but some bees (e.g., *Hylaeus, Nomada*) are slender, sparsely haired, and sometimes wasplike even in coloration. Morphological characters of the apiformes include the following: (1) Some of the hairs are plumose or branched. (In spheciformes they are simple.) Commonly, branched hairs of bees are visible at moderate magnification on various parts of the body and legs, but sometimes they are limited to a few areas (e.g., the propodeum) [Figs. 13 and 14] and can be difficult to see. (2) The hind basitarsus is broader than the subsequent segments of the tarsus and is commonly flattened [Fig. 11]; it does not have a gentle concavity on one side facing the tibial spurs and forming a cleaning structure, or strigilis. (In the spheciformes, the first and second tarsal segments are similar in width, and one side of the first forms, with the tibial spurs, a strigilis used in cleaning the opposite hind leg.)

A conveniently visible character that easily distinguishes nearly all bees from most sphecoid wasps is the possession by the wasps of golden or silvery hairs on the lower face, so that the face glitters in the light. Bees almost never have the same characteristic, because their hairs are duller, often erect, often plumose, or largely absent. This feature is especially useful in distinguishing small, wasplike bees such as *Hylaeus* from similar-looking pemphredonine wasps.

Collection and Preservation of Specimens

Until one is thoroughly familiar with the habitus and behavior of the bees in a particular area, it is difficult to identify many bees with certainty, even to the generic level, without collecting specimens and examining them microscopically or at least with a hand lens. Therefore, capturing and preserving specimens is essential for studies of bee ecology, pollination, and so forth. Standard entomological techniques of capturing with an insect net and using a killing jar or tube with cyanide or ethyl acetate are recommended. Because many bees are hairy, it is important to keep such jars or tubes dry; excess moisture or excess ethyl acetate mats the hairs, thus changing the appearance of the specimens and making it difficult to see important characters. Several hours in cyanide vapor in hot weather changes yellow integumental colors to red. To keep specimens dry and prevent such undesirable color changes, one should take them out of killing tubes or jars after they are dead and place them in pillboxes. Moisture will condense inside of closed vials, resulting in matted hairs; such vials or other sealed containers therefore should not replace pillboxes, although vials with loose cotton plugs will suffice for small numbers of specimens.

For easy handling as well as for long-term preservation, it is best to pin specimens a few hours after they are killed, using standard entomological procedures (cf. Oman and Cushmann 1946; Gibson 1960; Steyskal, Murphy, and Hoover 1986; Borror, De Long, and Triplehorn 1981). For example, small specimens whose thoraces would be disrupted by an insect pin should be glued to paper "points" or glued directly by the right side of the thorax to the insect pin at an appropriate height. (Have the glue encircle the pin to avoid loss later.) Steel minuten pins can be used instead of paper points for fresh material but not for dried material, which will not adhere to such pins. If it is impractical to pin specimens while they are still soft, they can be allowed to dry in the pillboxes or between layers of Cellucotton. Mild oven drying in the moist tropics helps to prevent mold. Later the specimens can be relaxed in a humid chamber until they are no longer brittle; then they can be pinned. Do not forget to label the pinned specimens.

For short-haired bees, like most stingless bees (Meliponinae), a satisfactory alternative is to put the bees directly from the net into vials of alcohol. They can then be pinned whenever convenient. For long-haired bees, the result of this procedure is matted hairs unless great care is exercised at the time of pinning to blow the hairs as they dry; this usually works well only if drying is from some fast-evaporating solvent rather than from alcohol. If available, critical-point drying provides good results. Long-term preservation in alcohol can be improved by freezing (L. Masner, pers. comm. 1987).

For many purposes, such as use of "Key to the Families," mouthparts should be extended. It is therefore desirable to open the mandibles and extend the proboscis for at least one specimen of each species while it is still soft.

Specimens killed with ethyl acetate commonly die with the mouthparts extended or are so relaxed that it is easy to extend them.

Once the specimens are on pins, it is easy to examine them from all angles under a microscope in order to see the characters used in identification. If unpinned material is used, such work is much more difficult and usually results in breakage if the specimens are dry and brittle.

It is surprisingly easy to ship dry pinned specimens through the mail—to have identifications verified, for example. An interior box containing the firmly pinned specimens should be surrounded by at least 5 cm of soft packing material in a sturdy outer box. However, persons not familiar with entomologists' methods should seek advice before committing a valuable lot of specimens to the post office.

Use of Data on Floral Visitations

Persons interested in floral biology, potential isolating mechanisms in plants, and the like frequently study insect visitors to flowers as possible pollinators. One must remember that every insect has to sit somewhere. Therefore, the mere presence of an insect, even of a bee, on a flower does not indicate a significant role in floral biology. For many flowers, great patience is needed to see and capture the principal pollinators. Moreover, plant populations probably often occur for at least a few years in habitats where the evolutionarily important pollinators are absent; studies of pollinators of a plant at diverse sites are therefore necessary for an adequate understanding of plant–pollinator relationships. Recognition of morphospecies in the field is often extremely difficult; therefore, substantial series of insect floral visitors must be collected. Although it is often of interest to ecologists as well as entomologists to record bees that collect pollen from a diversity of floral species (polylectic bees), it is also of great interest to investigate floral relationships of pollen specialists (oligolectic and monolectic bees), those that collect from related flowers or from a single species.

Even if bees are seen going from flower to flower and collecting pollen, they may or may not be significant pollinating agents. Minute bees, for example, may collect pollen from long stamens or take nectar from nectaries without going near the stigma. Such bees are thieves, parasites from the floral standpoint. They are highly interesting to us as students of bees but are of no significance for pollination biology. So observations of floral visitors, particularly on large flowers or on flowers with long stamens, need to include behavioral information that will help to distinguish pollinators from pollen thieves. Of course, there are numerous intermediates between these categories. A "thief" may sometimes contact a stigma, and pollinating bees are collecting pollen for their own food or that of their young—the amount they lose on stigmatic surfaces will depend on their behavior as well as on characteristics of the pollen and of the receptive surfaces.

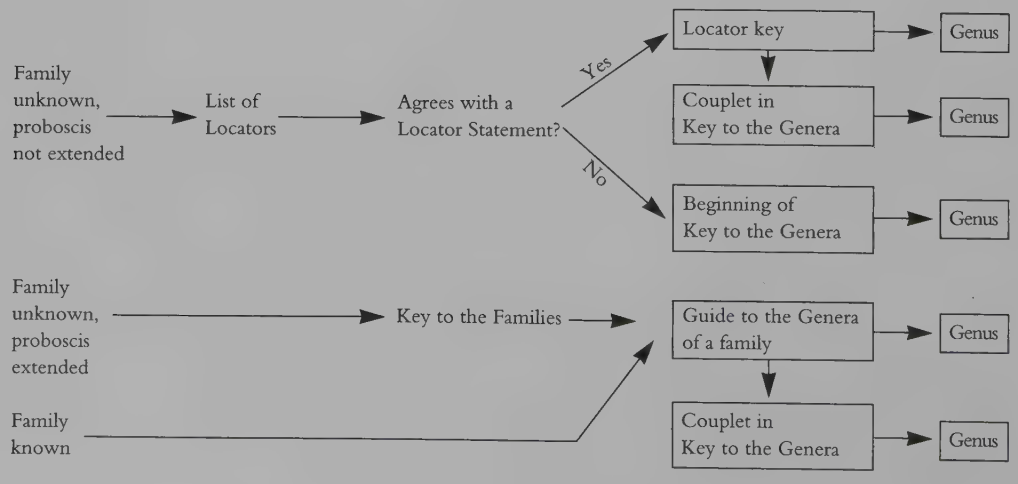


Fig. 1. Alternative routes to the identification of a specimen using the keys in this book.

How to Use This Work

The main parts of this work needed by a user wishing to identify a bee to the genus level are as follows:

Using the text and illustrations in the section "Terminology of Structures" when necessary, the user unfamiliar with bee identification can advantageously start with "Locators for the Key to the Genera." There are seven locators listed in that section. If the bee under study agrees with one of them, go to that locator; the locator key will lead to a genus or to a couplet in "Key to the Genera," thus bypassing much of that key. In "Locators" and "Key to the Genera," the bracketed number following a genus name can be used to find the genus in "Notes on the Genera" and in Appendix A.

Most male bees and some females do not agree with any of the seven locators. In that case, go to the beginning of "Key to the Genera."

Because there are many genera, "Key to the Genera" is long. Even if all decisions are clear, the use of such a long key is time-consuming and subject to error. The key is in places difficult to use; there are couplets where, even with the help of the illustrations, difficult decisions are required. We therefore encourage all bee students to open the mandibles and extend the mouthparts of some fresh specimens of each species and perhaps also pull out the genitalia of some males. Then, on reaching a generic name with "Key to the Genera," a worthwhile step will be to check the family characters with the help of "Key to the Families." Confidence in a generic identification will be improved if generic and family identifications correspond. Furthermore, the numerous habitus drawings and photographs provided in "Notes on the Genera" will help to verify identifications.

Cómo Usar Este Trabajo

Las partes necesarias de este trabajo para quien desee identificar una abeja a nivel de género son las siguientes:

El usuario no familiarizado con la identificación de abejas puede comenzar ventajosamente con "Localizadores para la Clave de los Géneros." La terminología usada para describir las diversas estructuras está indicada en las ilustraciones [Figs. 2–21]. Hay siete localizadores en esa seccíon. Si la abeja estudiada concuerda con uno de ellos, ir a ese localizador. La clave del localizador llevará a un género o a una alternativa de "Clave para los Géneros," evitando buena parte de ésta última. En "Localizadores" y "Clave para los Géneros" el número en corchetes detrás de un género se puede usar para localizar al género en "Notes on the Genera" y en "Appendix A."

La mayoría de los machos y algunas hembras no concuerdan con ninguno de los siete localizadores. En este caso ir al comienzo de "Clave para los Géneros."

Debido a que hay muchos géneros, "Clave para los Géneros" es larga. El uso de esta larga clave lleva tiempo y está sujeto a errores, aun cuando todas las decisiones sean claras. "Clave para los Géneros" es difícil de usar en algunas partes; hay alternativas que, aun con la ayuda de los dibujos, requieren decisiones difíciles de tomar. Es por esto que alentamos a quienes estudien las abejas a abrir las mandíbulas y extender las piezas bucales de algunos ejemplares frescos de cada especie y tal vez también jalar y dejar expuestos los genitales de algunos machos. De este modo, luego de llegar a un nombre genérico con "Clave para los Géneros," valdrá la pena cotejar seguidamente los caracteres de familia con la ayuda de "Clave para las Familias." Se tendrá así una mayor confianza cuando ambas identificaciones, genérica y familiar, correspondan. Además se proporcionan dibujos y fotografías de abejas enteras de muchos de los géneros; éstos ayudarán a verificar las identificaciones.

Some of the drawings associated with the keys are to varying degrees diagrammatic in order to emphasize the characters to which we refer. More important, in the keys we often refer to a figure that illustrates a particular character, even though that figure may be based on a different, sometimes unrelated genus of bees. Thus one should be careful in using illustrated features not mentioned in the keys. Appendix B lists the generic and, if known, specific identities of specimens used for the illustrations throughout the keys.

The families of bees are mostly distinguished by characters that are hard to see in dry specimens. Mouthpart and genitalic characters, for example, are usually hidden. Even the external characters of families are often hard to see or appreciate, like the two subantennal sutures of Andrenidae, or are found only in one sex, like the pollen-carrying scopa. Using readily visible features, it is therefore often easier to identify a bee to genus than to family. For this reason our "Key to the Genera" is even more artificial than most keys, in that it makes no attempt to indicate relationships, and related genera often come out far apart because of differences in readily visible or easily described characteristics. Some genera vary in such features and therefore appear in two or more places in "Key to the Genera."

Persons interested in bee systematics or, as suggested above, in verifying their identifications made by other means should run specimens through "Key to the Families." This requires study of the proboscis, which must therefore be exposed. Once the family is known, "Guide to the Genera of Each Family" can be used to verify generic identifications or lead to correct sections of "Key to the Genera."

"Notes on the Genera" provides information on each genus and may serve to corroborate or indicate doubts about an identification. Distributions of genera are given in some detail in "Notes," along with comments on abundance.

To facilitate use of "Key to the Genera," we indicate therein genera limited to the tropics and some other geographical areas, as well as genera that are rare or uncommon. The notation "SW" means that the genus is limited to the xeric areas, Texas to California and southward through the Mexican Plateau. The notation "W" means

Varios de los dibujos asociados con las claves son diagramáticos en diversa medida, de modo de enfasizar los caracteres a los cuales hacemos referencia. Más importante, en las claves nos referimos con frecuencia a una figura que ilustra un carácter en particular, aunque esa figura esté basada en un género diferente, a veces no relacionado. Es por esto que se debe ser cuidadoso en el uso de características ilustradas que no se mencionan en las claves. La identidad genérica, y específica si se la conoce, de los ejemplares usados para las ilustraciones se indica en "Appendix B."

Las familias de abejas se distinguen mayormente por caracteres que son difíciles de ver en especímenes secos. Caracteres de las piezas bucales y de los genitales, por ejemplo, están usualmente ocultos. Aun los caracteres externos de las familias son frecuentemente difíciles de ver o de apreciar, como las dos suturas subantenales de los Andrenidae, o se encuentran sólo en un sexo, como la escopa usada para llevar el polen. Es por esto que, usando caracteres fácilmente visibles, resulta más sencillo con frecuencia identificar el género a que pertenece una abeja que la familia. Por esta razón, nuestra "Clave para los Géneros" es aun más artificial que la mayoría de las claves, en cuanto que no se hace ningún intento de indicar relaciones, y géneros que están relacionados aparecen muy separados debido a diferencias en características fáciles de ver o de describir. Algunos géneros varían en tales características y por lo tanto aparecen en dos o más lugares diferentes en las claves.

Personas interesadas en la sistemática de las abejas o, como se sugiere arriba, en verificar por otros medios las identificaciones hechas deben utilizar "Clave para las Familias." Esto requiere el estudio de la proboscis, la cual debe entonces estar expuesta. Una vez que se conoce la familia, "Guía para los Géneros de Cada Familia" se puede usar para verificar identificaciones genéricas o para dirigirse a las secciones que corresponden en "Clave para los Géneros."

Se provee información sobre cada género en "Notes on the Genera," la que puede servir para corroborar o indicar dudas sobre la identificación. La distribución del los géneros se da con cierto detalle en "Notes on the Genera," junto con comentarios sobre abundancia.

Para facilitar el uso de "Clave para los Géneros," indicamos en ella aquellos géneros que están limitados a los trópicos o a alguna otra área geográfica, como también los géneros que son raros. La notación "SW" significa que el género está limitado a las regiones xéricas, de Texas a California y de allí al sur a lo largo de

that the genus is limited to North America from the Great Plains westward, often including most of Mexico. Lack of such notations indicates that the genus is neither rare nor uncommon and that it is somewhat widely distributed.

Both "Key to the Genera" and "Notes on the Genera" are based on species found within our area. Occasionally species occurring elsewhere will not run properly in "Key to the Genera." Numbers of species given in "Notes" reflect those found in our area; sometimes many more are found in other continents.

In summary, any bee from North or Central America should be identifiable by starting at the beginning of "Key to the Genera." Figure 1 indicates alternative routes that may reduce the time spent or the probability of errors. The genus name may be attained when one completes any of the boxes on the right. The identification should then be verified by reading in "Notes on the Genera," by trying alternative routes for identification, or by working backward through keys to verify agreement with all statements.

la Meseta Mexicana. La notación "W" significa que el género está limitado a América del Norte desde las Grandes Planicies hacia el oeste, incluyendo frecuentemente la mayor parte de México. La falta de estas notaciones para un género indica que éste no es raro y que está en algún modo ampliamente distribuído.

Tanto "Clave para los Géneros" como "Notes on the Genera" están basadas sobre especies que se encuentran en nuestra área. Ocasionalmente especies de otras partes no podrán ser identificadas apropiadamente con "Clave para los Géneros." El número de especies indicado en "Notes on the Genera" refleja aquellas encontradas en nuestra área; en algunos casos muchas más se encuentran en otros continentes.

Resumiendo, debe ser posible identificar toda abeja proveniente de América del Norte y América Central comenzando al principio de "Clave para los Géneros." El diagrama [Fig. 1] indica las rutas alternativas que pueden reducir el tiempo usado o la probabilidad de errores. Se habrá logrado el nombre del género una vez que se complete cualquiera de los recuadros a la derecha. La identificación debe ser entonces verificada leyendo en "Notes on the Genera," intentando rutas alternativas de identificación, o yendo hacia atrás en la clave de modo de verificar la concordancia con todos los enunciados.

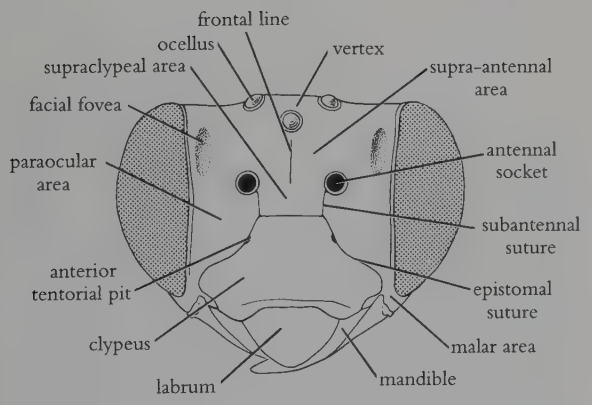


Fig. 2. Frontal view of head of a bee, showing major features used in identification.

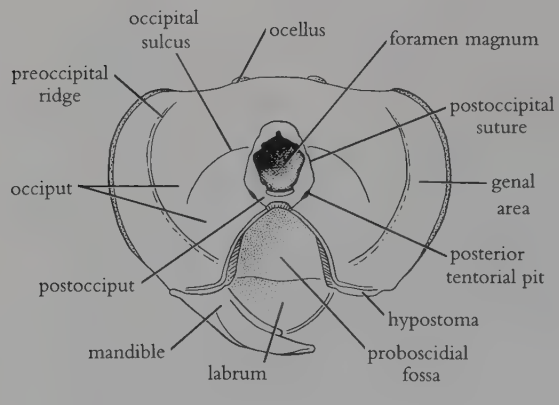


Fig. 3. Posterior view of head of a bee.

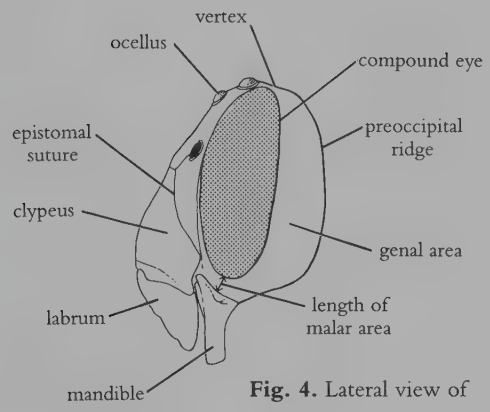


Fig. 4. Lateral view of head of a bee.

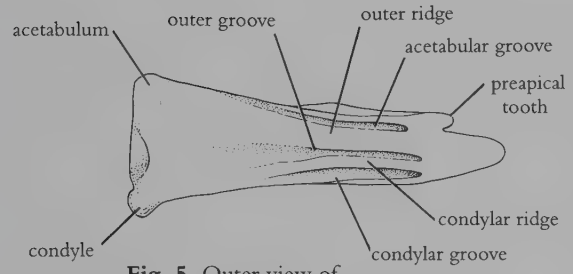
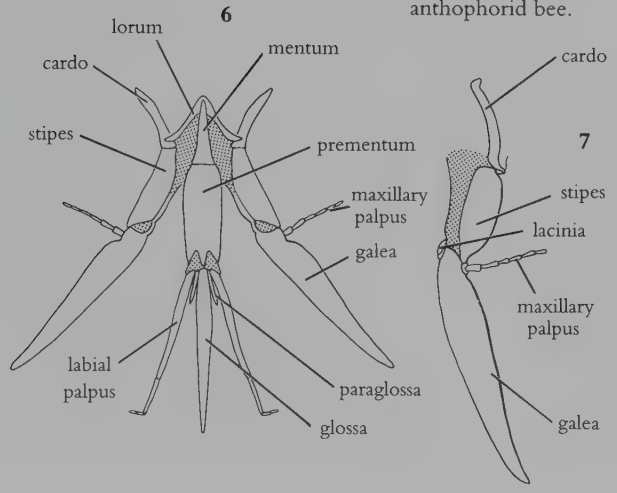


Fig. 5. Outer view of bee mandible, showing major features (cf. Michener and Fraser 1978 for comparative mandibular morphology).

Fig. 6. Diagram of proboscis of an anthophorid bee, seen in ventral or posterior view. **Fig. 7.** Lateral view of maxilla of an anthophorid bee.



Specific Identifications

Many users of this work will wish to get specific as well as generic names for bees. "Notes on the Genera" provides references to revisional papers and keys to species. Unfortunately, for some genera in some areas no such keys exist, and reliable identification of species is difficult or impossible to make. For the eastern United States and Canada, Mitchell (1960, 1962) provided keys to species of all genera. Reference to these keys is not made under each genus in "Notes on the Genera." For North America north of Mexico a catalog (Hurd 1979) lists described species and their ranges, floral records, synonyms, and appropriate bibliographical details.

The general works listed above and the revisions or keys to species listed in "Notes on the Genera" fail to provide help for some genera and some geographical areas. Revisional studies of many genera are needed to rectify this situation. We hope that the present book will facilitate entry of persons into the field of bee systematics and thus provide enough bee systematists to undertake studies of the genera that have not been revised recently (or at all). For various genera, accurate identification to species can be provided only by specialists, and for some genera no such specialists exist.

Terminology of Structures

For structures, we have in general followed the terminology used by Michener (1944); Urban (1967); Camargo, Kerr, and Lopes (1967); Eickwort (1969); Stephen, Bohart, and Torchio (1969); and Brooks (1988). We reproduce here illustrations redrawn from Michener (1944, 1965a) in which structures are labeled [Figs. 2–21]. See Snodgrass (1935, 1956) for detailed studies of general insect morphology and honey bee anatomy.

A question arises about the names for the three parts of the body. Logically they should be "head-thorax-abdomen" or "prosoma-mesosoma-metasoma." We prefer the first series, but we choose not to be logical. Because the first abdominal segment is incorporated into the thorax, the numbering of segments in the remainder of the abdomen should begin with 2 (as was done by Michener

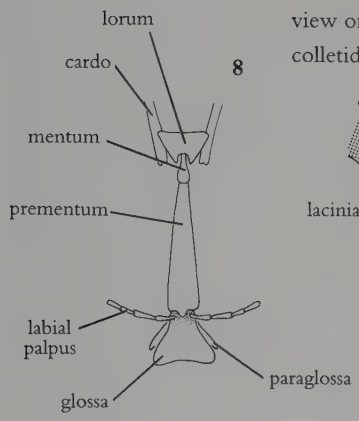


Fig. 8. Diagram of labium and associated maxillary cardines of a colletid bee, seen in ventral or posterior view. **Fig. 9.** Lateral view of maxilla of a colletid bee.

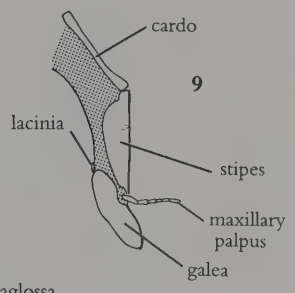
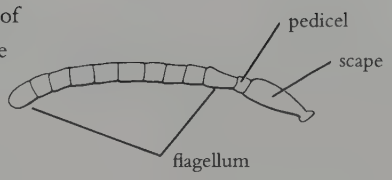


Fig. 10. Diagram of antenna of a female bee.



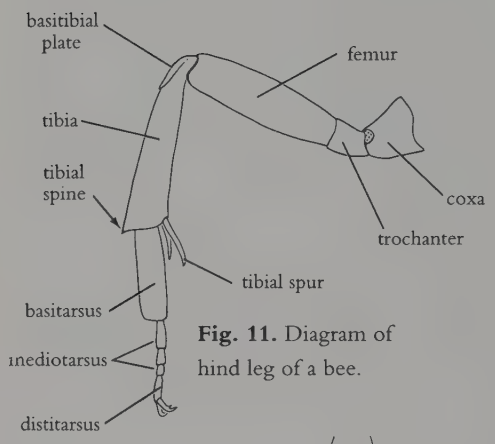


Fig. 11. Diagram of hind leg of a bee.

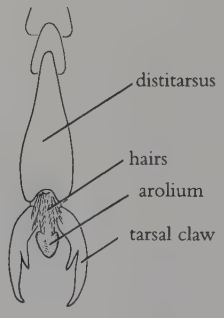


Fig. 12. Diagram of apex of bee leg, showing details of the distal tarsal segments.

1944). Custom, however, is to begin the numbering with 1. Thus "first abdominal segment" could mean either the propodeum (if the reference is to be morphologically correct) or the segment behind the propodeum, that is, the first segment of the metasoma. To make it clear that we are following the customary system of numbering, we always speak of metasomal rather than abdominal terga and sterna. The numbering is extremely important in bees because of the various structures that are on particular segments. We use the names *head, thorax,* and *metasoma* in order to combine familiar terms with a term that is not confusing for segmental numbering. We use abbreviations such as T1 (first metasomal tergum), S1 (first metasomal sternum), and so forth [Fig. 19]. Some particulars not shown or incompletely shown in the diagrams are explained below.

The sexes in bees are often quite different from one another, and in parts of the keys the sexes are treated separately. Males have 13 antennal segments (12 in *Neopasites* and *Holcopasites*); females have 12 [Fig. 10]. Males usually have 7 exposed metasomal terga; females have 6 [Fig. 19]. Sometimes the apical terga are retracted beneath the preapical ones, so that female Halictinae, for example, appear to have only 5 terga, and in some male bees it is difficult to see the 7th tergum because it is largely, or rarely wholly, hidden. Females have stings, and males have male genitalia [Fig. 20]; but both are commonly retracted, and in some females the sting is rudimentary.

For names of mandibular structures [Fig. 5], we usually follow Michener and Fraser (1978). For simplicity we often refer to *preapical teeth* on the upper margin instead of teeth of the pollex. Other terms used herein are the *condylar ridge,* which arises near the mandibular condyle and extends toward the apex of the mandible, and the *outer ridge,* which is the next ridge above the condylar ridge on the outer surface of the mandible.

The *malar area* [Fig. 2] is the space between the eye and the mandible; its length is the shortest distance from the eye to the mandible [Fig. 4]; the width of this area is the width of the base of the mandible. The *foveae* (singular: *fovea*) of the face [Fig. 2] and of the sides of the second metasomal tergum are shallow depressions, usually black

Fig. 13. Lateral view of bee thorax; tegula omitted.

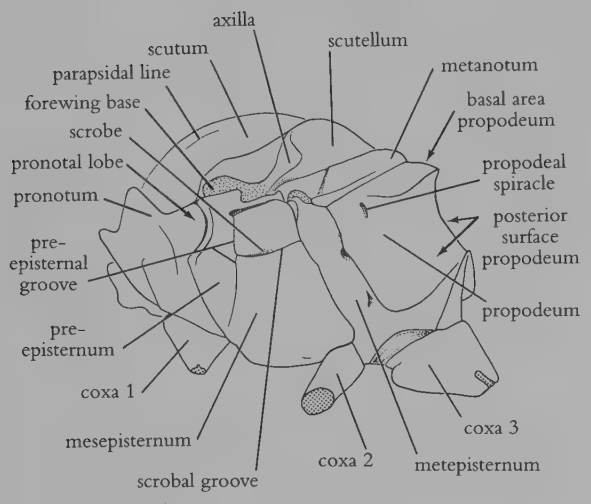
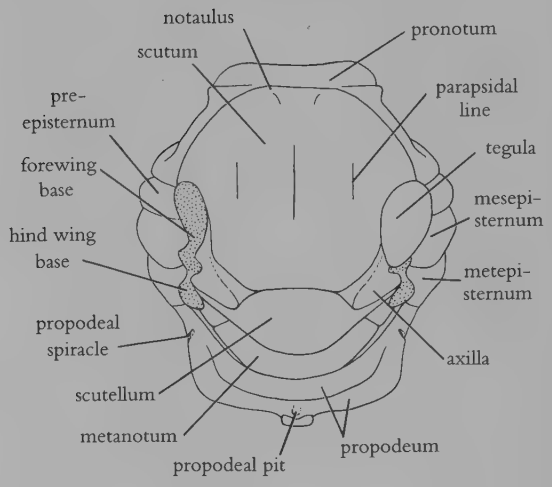


Fig. 14. Dorsal view of bee thorax; tegula omitted on left side.



in color, variable in shape from broad to linear. The term *orbit* is often used for the eye margin, *inner orbit* for the frontal or facial margin, and *outer orbit* for the genal margin. The *genal area* is the region behind the eye and in front of the preoccipital ridge [Figs. 3 and 4]. The ridge surrounding the concave posterior surface of the head above and laterally is called the *preoccipital ridge* [Fig. 3]. A carina sometimes found on this ridge is the *preoccipital carina*. The *proboscidial fossa* is the large, deep groove on the underside of the head into which the proboscis folds [Fig. 3].

The bee thorax is a compact structure consisting of sclerites of the pro-, meso- and metathoracic segments, which bear the legs and wings, and the first true abdominal segment, termed the *propodeum* [Figs. 13 and 14]. The prothorax in bees is represented primarily by the large *pronotum,* which extends laterally and meets ventrally behind the forecoxae, forming a tubelike structure. The *pronotal lobe* is a useful landmark, and its shape and location may be used in generic identification. The mesothorax and metathorax bear the wings and the second and third pairs of legs. In dorsal view [Fig. 14], the mesothorax can be divided into four distinct sclerites: the scutum, the scutellum, and paired axillae. Dorsally, the metathorax consists of a single sclerite, the metanotum. Laterally [Fig. 13], the mesothorax is represented by the *mesepisternum,* sometimes referred to as the mesopleuron. The mesepisternum sometimes is divided by the *pre-episternal groove* into the *pre-episternum* (or pre-episternal area) and the rest of the mesepisternum The shape and location of the pre-episternal groove, the *scrobal groove,* and the *scrobe* are often important in generic identification. The *metepisternum* (or metapleuron) forms the lateral surface of the metathorax. The *wing bases* are located above the upper margins of the mesepisternum and the metepisternum.

The form and subdivisions of the propodeum are not easy to illustrate but are exceedingly important systematically. Many bees have a pair of impressed lines on the propodeum, beginning near the anterior dorsolateral parts of the propodeum and extending downward and posteromesially and nearly meeting in the *propodeal pit* [Fig. 149], a median depression of the lower posterior surface. These lines, together with the anterior dorsal margin of the propodeum, enclose the *triangular area,* or *propodeal triangle* [Fig. 149]. Morphologically, this triangle is the metapostnotum (Brothers 1976). The shape of the propodeum as seen in profile is quite independent of the triangle. The whole propodeum may be vertical or nearly so, dropping from the posterior margin of the metanotum. In this case it is termed declivous. However, as in Figure 13, there

may be a more or less horizontal basal region. In Figure 13 it is separated by a sharp line, or carina, from the declivous posterior surface. When such is the case, the horizontal part is called the *basal zone,* or *basal area,* of the propodeum [Fig. 13]. It is part of the propodeal triangle. The term "basal area" is applicable even if no sharp line separates the horizontal from the vertical surfaces. In some bees the two surfaces are continuously rounded, one onto the other in a broad curving surface; in that case the term "basal area" is not definable unless there is distinctive surface sculpturing.

Wings are illustrated, and the veins labeled, in Figures 15 and 16, using a modified Comstock and Needham system. Because the homologies of the veins are not very certain, as well as because some comparable-looking veins have very different morphological names, it has seemed best to continue the use of some terms that are morphologically noncommittal for certain cells and veins much used in taxonomy. The names of cells and certain noncommittal names for veins are shown in Figures 17 and 18.

Of special importance are three veins that all look like crossveins: the second abscissa of Rs (or first transverse cubital), first r-m (or second transverse cubital), and second r-m (or third transverse cubital), to use the Comstock and Needham system. These veins help to define the submarginal cells, which are usually either three or two in number. The problem is that when there are only two submarginal cells, an investigator sometimes does not know whether the missing vein is the second abscissa of Rs or the first r-m; both losses can apparently occur and result in two submarginal cells. In this case, expression is greatly simplified by using the terminology indicated in Figure 17.

Wings are described as though spread, so that the direction toward the costal margin (where the stigma is in the forewing) is called *anterior;* toward the wing apex, *distal.* To save space, the word *stigma* is used in place of *pterostigma* [Fig. 15].

The *jugal* and *vannal lobes* of the hind wing are both measured from the wing base to the apices of the lobes. Thus, on Figures 16 and 18 one might say that the jugal lobe is about two-thirds as long as the vannal.

Some authorities advocate a system for identifying parts

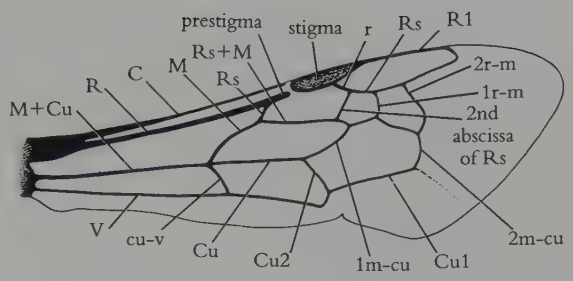


Fig. 15. Diagram of bee forewing, showing veins (terminology of Michener 1944, modified from Ross, using the Comstock and Needham system).

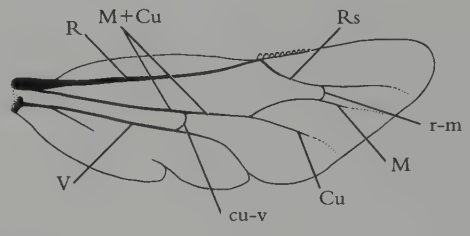


Fig. 16. Diagram of bee hind wing, showing veins (terminology as in Fig. 15).

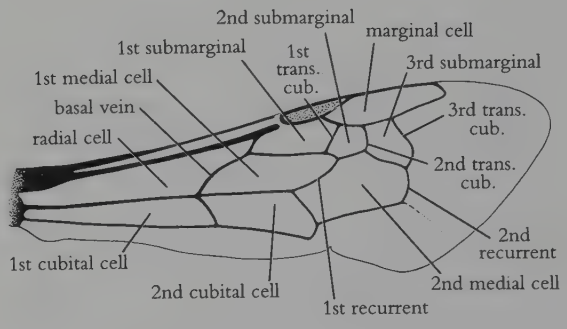


Fig. 17. Diagram of bee forewing, showing terminology of cells (areas enclosed by wing veins) and morphologically noncommital terms for certain veins (e.g., basal vein, second recurrent vein). These terms are used extensively in taxonomic works, partially because of the questionable homologies implied in the Comstock and Needham system.

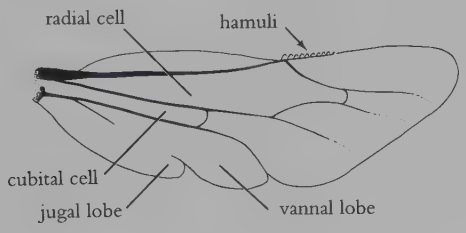


Fig. 18. Diagram of bee hind wing (terminology as in Fig. 17). The names of the cells are sometimes abbreviated, e.g., R for radial cell, 2nd M for second medial cell.

of legs that assumes that all legs are pulled out laterally at right angles to the long axis of the body. Although we appreciate the logic of that system, we follow the more traditional system in which the legs are considered to be in their normal positions. Thus, we consider the corbicula of Apidae [Fig. 22] to be on the outer, not the anterior, surface of the hind tibia, and we consider the two hind tibial spurs to be outer and inner, not anterior and posterior.

The *tibial spurs* are the movable inferior apical spurs on the tibiae; the *tibial spines* are immovable, sharp, superior, apical projections, usually small in size, found in some bees (see Fig. 11 and Michener 1944). Description of the tibial spurs is important in many bees; this is especially so of the *inner hind tibial spur.* This spur usually has two toothed margins. It is the inner one that is commonly elaborated in various ways. It may be finely or coarsely serrate. Following custom, we have described this margin as ciliate if it has slender, almost hairlike projections (usually numerous), although in many cases the appearance is like that of a fine comb. Also following custom, we have described a spur as pectinate if its inner margin is produced into a few long, coarse, often blunt projections [Fig. 154], even though the number of such projections is in some cases reduced to only two or three.

The *basitibial plate* is a plate on the outer side of the base of the hind tibia of many bees [Figs. 11, 174, and 175], presumably important for support as bees move up or down their burrows in the soil. Commonly it is surrounded by a carina or a sharp line of some sort and has vestiture (if any) different from that of adjacent regions, but it may be indicated only by a series of tubercles, or even by a single tubercle, and in some cases (as in *Xylocopa*) its apex is represented by a structure near the middle of the tibia.

On the inner surface of the hind tibia of most bees is an area of variable size covered with hairs of uniform length, usually blunt or briefly bifid. These are called *keirotrichia.*

Between the *tarsal claws* there is often a protruding, padlike *arolium* (plural: *arolia*) [Fig. 12].

The *scopa* (plural: *scopae*) is the pollen-carrying brush of hairs. If such hairs surround a space in which pollen is carried, they are said to form a *corbicula.* The best known corbicula is on the outer side of the hind tibia of Apidae, but other corbiculae are on the underside of the hind femur of Andrenidae, Halictidae, Colletidae, and others and on the side of the propodeum of many species of *Andrena.* In most bees the scopa is on the hind legs, but in Megachilidae and some others it is on the underside of the metasoma. Scopae are, of course, found only on nonparasitic females; in the keys, we do not state this fact in every case. Scopae are absent in parasitic bees, in all male bees, in queens of highly social bees, and in *Hylaeus.*

Each metasomal tergum or sternum (except for the anteriormost and the reduced apical ones) consists of a plate commonly marked by some transverse lines, as follows: (1) Across the anterior margin, always completely hidden in the intact metasoma, is the *antecosta.* (2) Basal to the middle of each plate is another transverse line, the *gradulus* (plural: *graduli;* Fig. 19). The ends of the tergal graduli, unless bent strongly to the rear, are usually near the spiracles. If bent strongly to the rear, the resultant longitudinal lines are called *lateral parts* or *lateral arms of the graduli* or, if carinate, *lateral gradular carinae.* The area anterior to the gradulus is usually at a slightly higher level than that posterior to it, so that the gradulus is like a minute step. The graduli are often concealed on the intact metasoma but, especially on the second tergum and sternum, are sometimes exposed. (3) Near the posterior margin of each tergum and sternum is usually another transverse line, the *premarginal line,* separating the *posterior marginal area* from the rest of the sclerite. This area is often depressed but in other cases differs only in sculpturing from the area basal to it.

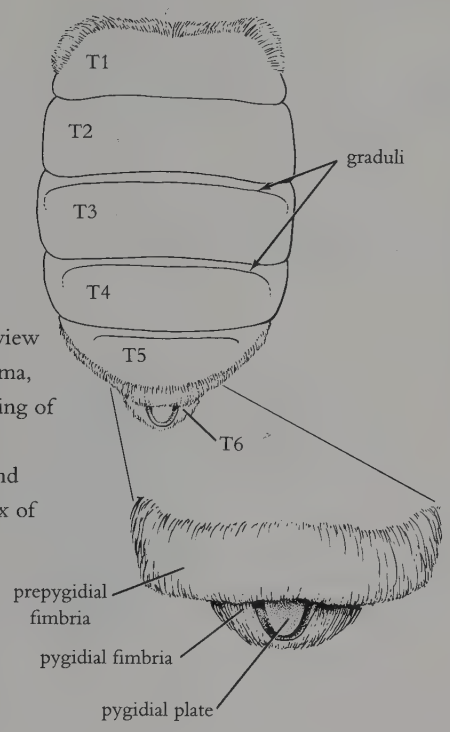


Fig. 19. Dorsal view of female metasoma, showing numbering of segments (T1 = tergum 1, etc.) and details of the apex of the metasoma.

The *pygidial plate* [Fig. 19] is a usually flat plate, commonly surrounded by a carina or a line and in some cases produced as an apical projection, on T6 of females or T7 of males. The *prepygidial fimbria* is a dense band of hairs across the apex of T5 of females. It is conspicuously different from, usually denser than, the apical hair bands or fasciae of preceding terga. Dense hairs on T6 of females, on each side of the pygidial plate, constitute the *pygidial fimbria* [Fig. 19].

The genitalia and seventh and eighth metasomal sterna of male bees [Figs. 20 and 21] exhibit many interesting characters and may be dissected out for study. In some groups the sixth, fifth, and even the fourth sterna are also hidden and modified. On a freshly relaxed specimen it is usually possible to reach between the apical exposed tergum and sternum and, with a hooked needle, pull out the genitalia and hidden sterna. In most cases such dissection is not difficult, but in the Megachilidae the numerous hidden sterna are firmly connected to one another and to the terga laterally and are often delicate medially, so that successful dissection may be difficult. Beginners should start with other groups.

Fig. 20. Diagram of male genitalia of a colletid bee, ventral view. The gonostylus in this case is somewhat recognizable in form. In some bees it is indistinguishably incorporated into the gonocoxite, in others it is probably lost, and in still others it is distinct and articulated to the gonocoxite. When the gonostylus and gonocoxite are fused, the entire structure is referred to as the gonoforceps. Even in such cases the gonostylar part is often suggested by the presence of hairs, whereas the gonocoxite usually has only a few minute hairs.

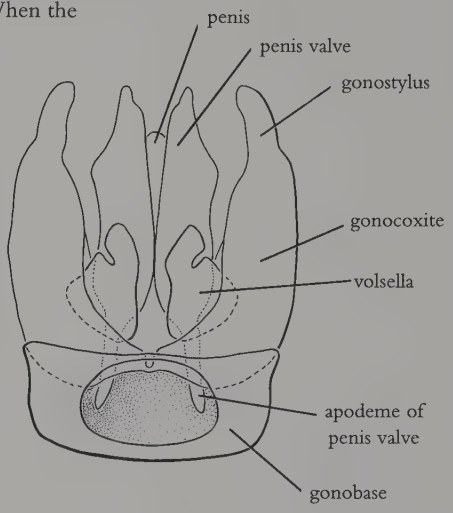
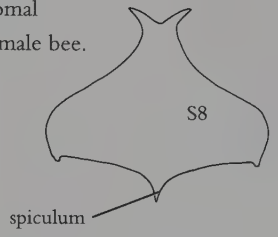


Fig. 21. Diagram of eighth metasomal sternum of a male bee.



S8 of males usually has a median basal point or angle for muscle attachment that is absent on other sterna. It is called the *spiculum* [Fig. 21].

For gross observations, sterna and genitalia may be preserved dry, glued to a card on the pin with the specimen. For more detailed study, they should be treated with 10% potassium hydroxide or sodium hydroxide to remove the muscle tissue, then acidulated in weak acetic acid, placed for study in glycerin, and transferred for preservation to microvials, kept with the specimen by running the pin through the stopper. Preservation on slides has the disadvantage of making side views impossible, as well as crushing the genitalia, which are often quite thick.

Locators for the Key to the Genera

Localizadores para la Clave de los Géneros

For persons familiar with apoid taxa, "Key to the Genera" can be worked backwards. The starting point(s) can be found easily because after each genus in "Notes on the Genera," as well as in the Index, there are entries showing the couplet or couplets where that genus keys out. Because the genera are grouped by higher taxa (families, subfamilies, and tribes) in "Notes," one can also learn where representatives of each higher taxon appear in the key. Usually the genera of a higher taxon are not all in one place in the key, because of the effort to use characters that are easily seen rather than the often difficult characters of the higher taxa.

For persons not familiar with apoid taxa, "Key to the Genera" may appear forbiddingly long. Seven locators are provided to bypass portions of it and thus facilitate identifications. Not all bees agree with any of the initial locator statements; those that do not should be run from the beginning of "Key to the Genera" or through "Key to the Families" (see "How to Use This Work").

Cuando se está familiarizado con los taxa de los Apoidea, "Clave para los Géneros" se puede usar de atrás para adelante. Los puntos donde comenzar se puede encontrar fácilmente, pues luego de cada género en "Notes on the Genera," como así también en "Index," se hace referencia a la alternativa o alternativas donde cada género aparece en la clave. Puesto que en "Notes" éstos están agrupados por categorías superiores (familias, subfamilias, y tribus), también se puede encontrar donde aparecen en la clave los representantes de cada una de esas categorías. Usualmente los géneros de una categoría superior no están todos en un mismo lugar en la clave, debido al uso de caracteres que son fácilmente visibles en vez de aquellos caracteres de las categorías superiores frecuentemente difíciles de ver.

Para personas no familiarizadas con los taxa de los Apoidea, "Clave para los Géneros" puede parecer prohibitivamente larga. Se proveen siete localizadores que permiten evitar porciones de "Clave para los Géneros" y facilitan así las identificaciones.

Cada uno de los siete localizadores comienza con un enunciado. Una abeja que concuerda con este enunciado puede ser

Each numbered locator begins with a statement. A bee agreeing with that statement can be run through the locator key (with lettered couplets) following that statement. The locator key leads to numbered couplets of the main key or to particular genera. Thus specimens that agree with the initial statement of any of the locators can be identified relatively quickly. Locators 1 to 5 function only for females. Locators 6 and 7 work for both sexes.

The following is a list of the locators:

1. Outer surface of hind tibia with a usually flat or concave, shining, and largely hairless area surrounded by fringes to form a corbicula [Fig. 22].
2. Ventral surface of metasoma with scopa of pollen-carrying hairs [Fig. 23]; hind leg without scopa; two submarginal cells [Fig. 25].
3. Scopa of pollen-carrying hairs extensively developed on hind femur [Fig. 26], frequently on tibia as well (commonly also on trochanter), and forming a corbicula on underside of femur.
4. Scopa of pollen-carrying hairs well developed on hind tibia (but not forming a corbicula), reduced or absent on hind femur and trochanter [Fig. 27].
5. Scopa absent (on both hind legs and metasomal sterna).
6. Basal vein of forewing strongly arcuate or subangulate near base [Fig. 28]; T5 of females (except in parasitic genera) with longitudinal median zone or triangular area of short, dense hairs, or minute, dense punctation (and sometimes with a slit) dividing the prepygidial fimbria [Fig. 29]; T6 of females ordinarily completely hidden by T5.
7. Arolia absent [compare Figs. 30 and 31].

pasada por la clave que le sigue (alternativas con letras). Esta clave lleva a alternativas numeradas de la clave principal o a ciertos géneros. De este modo especímenes que coinciden con el enunciado inicial de uno de los localizadores pueden ser identificados relativamente rápido. De ningún modo todas las abejas concuerdan con alguno de los localizadores; en ese caso se debe utilizar la clave principal. Los localizadores 1 a 5 funcionan sólo para las hembras; los localizadores 6 y 7 sirven para ambos sexos.

En las claves que siguen y en la clave principal los segmentos del metasoma se identifican con letras y números, por ejemplo T1 (primer tergo del metasoma) [Fig. 19] y S1 (primer esterno del metasoma) (ver "Terminology of Structures" en "Introduction").

La siguiente es la lista de los localizadores:

1. Superficie externa de la tibia posterior con un área usualmente plana o cóncava, brillante, mayormente glabra, orlada de pelos, formando una corbícula [Fig. 22].
2. Superficie ventral del metasoma con escopa de pelos para llevar polen [Fig. 23]; patas posteriores sin escopa; dos celdas submarginales [Fig. 25].
3. Escopa de pelos colectores de polen de la pata posterior especialmente bien desarrollada en el fémur [Fig. 26], comúnmente en la tibia también (comúnmente en el trocánter también), y en la faz inferior del fémur formando una corbícula (hembras).
4. Escopa de pelos colectores de polen bien desarrollada sobre la tibia posterior (pero no formando corbícula), reducida o ausente sobre el fémur y trocánter posteriores [Fig. 27].
5. Escopa ausente (tanto en las patas posteriores cómo en los esternos del metasoma).
6. Vena basal del ala anterior fuertemente arqueada o subangulosa cerca de la base [Fig. 28]; T5 de la hembra (excepto en abejas parásitas) con una zona longitudinal media o área triangular con pelos cortos y densos o con puntuación fina y densa (y a veces con una hendidura) dividiendo la fimbria prepigidial [Fig. 29]; T6 de las hembras por lo común completamente oculto por T5.
7. Arolios ausentes [compare Figs. 30 y 31].

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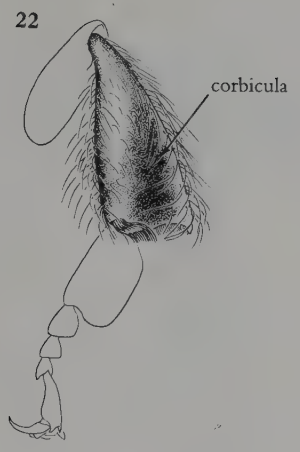

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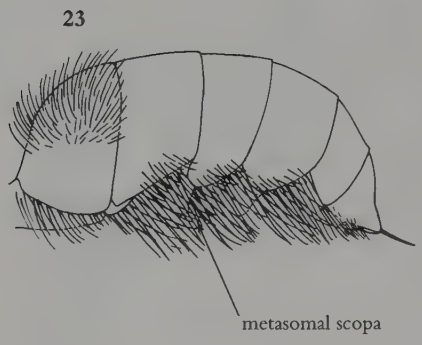

LOCATOR 1

Outer surface of hind tibia with a usually flat or concave, shining, and largely hairless area surrounded by fringes to form a corbicula [Fig. 22] (most female Apidae) ..... a

a. Hind tibial spurs absent [Fig. 54] ..... b

— Hind tibial spurs present and conspicuous [Fig. 55] c

b(a). Eyes hairy; venation strong [as in Fig. 35] (Apidae, Apinae) ..... *Apis* [151]

— Eyes bare; transverse cubital veins, second recurrent vein and apex of marginal cell weak or absent [Figs. 32–34] (Apidae, Meliponinae) (tropical) ..... go to couplet 3

c(a). Proboscis in repose not reaching metasoma; body nonmetallic; comb of bristles on base of hind wing absent (Apidae, Bombinae) ..... *Bombus* [152]

— Proboscis in repose reaching beyond base of metasoma; body usually at least partly metallic; comb of bristles in position of jugal lobe of hind wing present [Fig. 65] (Apidae, Euglossinae) (tropical) ..... go to couplet 22

LOCALIZADOR 1

Superficie externa de la tibia posterior con un área usualmente plana o cóncava, brillante, mayormente glabra, orlada de pelos, formando una corbícula [Fig. 22] (la mayoría de las hembras de Apidae) ..... a

a. Espolones tibiales posteriores ausentes [Fig. 54] ..... b

— Espolones tibiales posteriores presentes, conspicuos [Fig. 55] c

b(a). Ojos pilosos; venación fuerte [como en Fig. 35] (Apidae, Apinae) ..... *Apis* [151]

— Ojos glabros; venas transversas cubitales, segunda recurrente y ápice de la celda marginal débiles o ausentes [Figs. 32–34] (Apidae, Meliponinae) (tropical) ..... ir a 3

c(a). Proboscis en reposo no alcanza el metasoma; cuerpo no metálico; peine de setas en la base del ala posterior ausente (Apidae, Bombinae) ..... *Bombus* [152]

— Proboscis en reposo sobrepasando la base del metasoma; cuerpo usualmente al menos en parte metálico; peine de setas en lugar del lóbulo yugal del ala posterior presente [Fig. 65] (Apidae, Euglossinae) (tropical) ..... ir a 22

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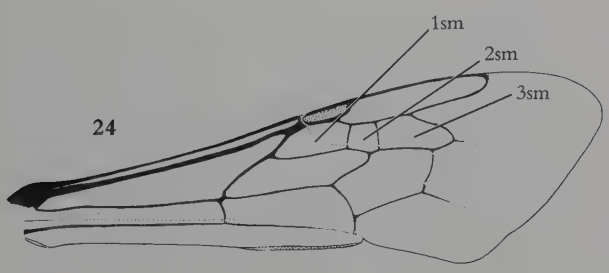

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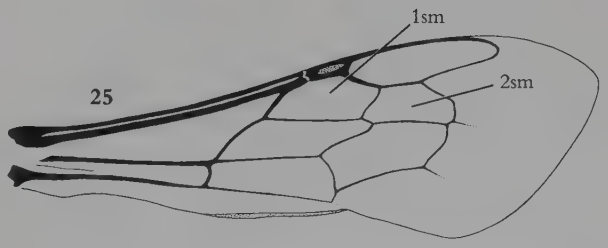
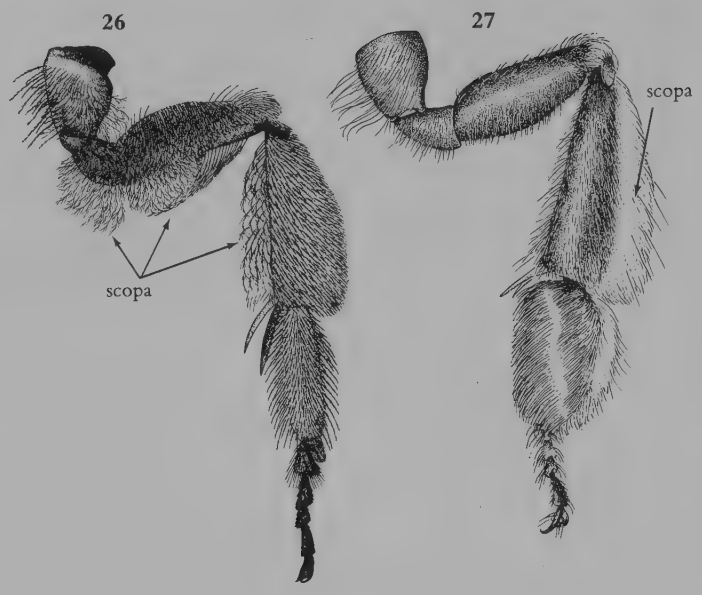




LOCATOR 2

Ventral surface of metasoma with scopa of pollen-carrying hairs [Fig. 23]; *hind leg without scopa; two submarginal cells* [Fig. 25] (most female Megachilidae) ..... a

a. Mandible tridentate, middle tooth longer than others [Fig. 347]; outer surfaces of tibiae with numerous coarse spicules not ending in hairs or bristles [Fig. 348] (Megachilidae, Lithurginae) .... *Lithurge* [60]

— Mandible bidentate to multidentate with apical (lower) tooth longest [Figs. 371 and 372]; outer surfaces of tibiae without coarse spicules or, if spiculate, usually with hair arising from apex of each (Megachilidae, Megachilinae) ..... b

b(a). Thorax and/or metasoma with yellow, white, or red integumental markings or rarely body largely red; metasomal terga ordinarily without apical bands of pale hair (*Hoplostelis* lacks a scopa.)..... ..... go to couplet 207

— Thorax and metasoma without integumental markings, black or metallic; metasoma above sometimes largely red; metasomal terga often with apical bands of pale hair..... go to couplet 220

LOCALIZADOR 2

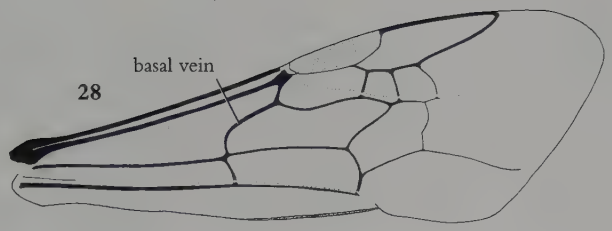
Superficie ventral del metasoma con escopa de pelos para llevar polen [Fig. 23]; *patas posteriores sin escopa; dos celdas submarginales* [Fig. 25] (la mayoría de las hembras de Megachilidae) ..... a

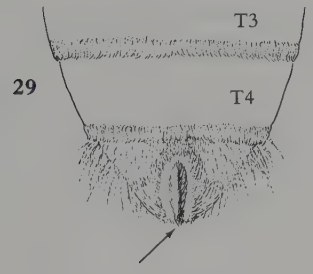
a. Mandíbula tridentada, diente medio mayor que los otros [Fig. 347]; superficie externa de las tibias con numerosas espículas gruesas carentes de pelo o seta terminal [Fig. 348] (Megachilidae, Lithurginae)..... *Lithurge* [60]

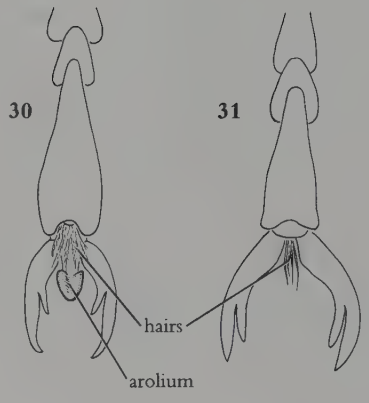
— Mandíbula bidentada o multidentada con diente apical (inferior) el más fuerte [Figs. 371 y 372]; superficie externa de las tibias sin espículas gruesas o, cuando presentes, espículas usualmente con pelo terminal (Megachilidae, Megachilinae)..... b

b(a). Tórax y/o metasoma con manchas del tegumento amarillas, blancas, o rojas o raramente el cuerpo extensamente rojo; tergos del metasoma comúnmente sin bandas apicales del pelos claros (*Hoplostelis* carece de escopa.) .... ir a 207

— Tórax y metasoma con tegumento negro o metálico, sin manchas; metasoma a veces extensamente rojo; tergos del metasoma frecuentemente con bandas apicales de pelos claros..... ir a 220







LOCATOR 3

Scopa of pollen-carrying hairs extensively developed on hind femur [Fig. 26] *(frequently also on tibia and trochanter) and forming a corbicula on underside of femur* (females) ..... a

a. With three submarginal cells [Fig. 24] .....b

— With two submarginal cells [as in Fig. 25] ..... h

b(a). First recurrent vein meeting *first* transverse cubital or within one or two vein widths of it [Fig. 56]; stigma no wider than prestigma measured to wing margin [Fig. 56] (Colletidae, Diphaglossinae, part) ..... go to couplet 15

— First recurrent vein far beyond first transverse cubital, often near or beyond second transverse cubital [Fig. 57]; stigma often wider than prestigma [Fig. 57] (If first recurrent vein near first transverse cubital, as in some *Mydrosoma,* wing length under 12 mm.) c

c(b). Second recurrent vein distinctly arcuate outward in its posterior portion [Fig. 79] (Colletidae, Colletinae, part) ..... *Colletes* [1]

— Posterior portion of second recurrent vein not arcuate outward [Fig. 80] .....d

d(c). Marginal cell rounded at apex, which is on or almost on wing margin [Fig. 84]; first and third submarginal cells subequal in length of posterior margins, ordinarily much longer than second, which is quadrate [Fig. 84]; jugal lobe of hind wing much

LOCALIZADOR 3

Escopa de pelos colectores de polen de la pata posterior especialmente bien desarrollada en el fémur [Fig. 26] *(comúnmente en la tibia y el trocánter también), y en la faz inferior del fémur formando una corbícula* (hembras) .....a

a. Con tres celdas submarginales [Fig. 24] ..... b

— Con dos celdas submarginales [como en Fig. 25] ..... h

b(a). Primera vena recurrente unida a la *primera* transversa cubital o alejada de ésta por no más de una o dos veces el grosor de la vena [Fig. 56]; estigma no más ancho que el prestigma medido hasta el margen alar [Fig. 56] (Colletidae, Diphaglossinae, parte) .....ir a 15

— Primera vena recurrente mucho más allá de la primera transversa cubital, frecuentemente cerca o pasando la segunda transversa cubital [Fig. 57]; estigma frecuentemente más ancho que el prestigma [Fig. 57] (Si la primera vena recurrente está cerca de la primera transversa cubital, como en algunas *Mydrosoma,* largo alar menos de 12 mm.) c

c(b). Segunda vena recurrente conspicuamente arqueada hacia afuera en la porción posterior [Fig. 79] (Colletidae, Colletinae, parte) ..... *Colletes* [1]

— Segunda vena recurrente con la porción posterior no arqueada hacia afuera [Fig. 80] ..... d

d(c). Celda marginal con ápice redondeado sobre o casi sobre el margen alar [Fig. 84]; primera y tercera celdas submarginales con margen posterior de largo subigual, común-

over three-fourths as long as vannal lobe [Fig. 115] (Halictidae, Nomiinae) ..... go to couplet 36

— Marginal cell with apex pointed [Fig. 83], minutely truncate [Fig. 86], or bent well away from wing margin [Fig. 89]; submarginal cells not as above; jugal lobe of hind wing three-fourths as long as vannal lobe or usually much less [Fig. 114] ..... e

e(d). Body extraordinarily coarsely punctate; certain metasomal terga with yellow to white integumental bands; preoccipital ridge formed as strong lamella (Colletidae, Colletinae, part) (tropical to Arizona) ..... *Eulonchopria* [2]

— Body not especially coarsely punctate; metasoma without integumental bands; preoccipital ridge not lamellate ..... f

f(e). Third submarginal cell shorter than second [Fig. 35] (Colletidae, Diphaglossinae, part) (rare, tropical) ..... *Mydrosoma* (part) [6]

— Third submarginal cell as long as or longer than second [as in Fig. 24] ..... g

g(f). Stigma absent or nearly so [Fig. 192] (Oxaeidae) .. .. go to couplet 94

— Stigma present, rather large [Figs. 118 and 119] (The few parasitic genera in this part of the key lack a well-developed scopa, and *Melitta* lacks a strong femoral scopa.) ..... go to couplet 37

h(a). Basal vein strongly arcuate near base [as in Fig. 101] (Subgroups, sometimes recognized as genera, are characterized in "Notes.") (Halictidae, Halictinae, Halictini) ..... *Lasioglossum* (part) [40]

— Basal vein gently and rather uniformly arcuate or straight [as in Fig. 100] i

i(h). Antennal bases near middle of face [Fig. 343]; clypeus with upper margin arched up into face so that it is not short and transverse [Fig. 343] (Andrenidae, Andreninae) ..... *Andrena* (part) [10]

— Antennal bases well below middle of face [Fig. 331]; clypeus short, transverse, its upper margin not much arched up into face [Fig. 331] (Halictidae, Rophitinae) ..... go to couplet 188

mente mucho más largas que la segunda, que es cuadrada [Fig. 84]; lóbulo yugal del ala posterior mucho más de tres cuartos del largo del lóbulo vanal [Fig. 115] (Halictidae, Nomiinae) ..... ir a 36

— Celda marginal con ápice aguzado [Fig. 83], levemente trunco [Fig. 86], o bien curvado alejándose del margen alar [Fig. 89]; celdas submarginales no como arriba; lóbulo yugal del ala posterior tres cuartos del largo del lóbulo vanal o usualmente mucho menos [Fig. 114] ..... e

e(d). Cuerpo con puntuación extraordinariamente fuerte; tegumento de algunos tergos del metasoma con bandas amarillas a blancas; borde preoccipital formando una fuerte lámina (Colletidae, Colletinae, parte) (tropical hasta Arizona) ..... *Eulonchopria* [2]

— Cuerpo con puntuación no especialmente fuerte; tegumento del metasoma sin bandas; borde preoccipital no laminado ..... f

f(e). Tercera celda submarginal más corta que la segunda [Fig. 35] (Colletidae, Diphaglossinae, parte) (raro, tropical) ..... *Mydrosoma* (parte) [6]

— Tercera celda submarginal tan larga o más larga que la segunda [como en Fig. 24] ..... g

g(f). Estigma ausente o casi [Fig. 192] (Oxaeidae) ..... ir a 94

— Estigma presente, más bien grande [Figs. 118 y 119] (Los pocos géneros parásitos en esta parte de la clave carecen de escopa bien desarrollada, y *Melitta* carece de escopa femoral fuerte.) ..... ir a 37

h(a). Vena basal fuertemente arqueada cerca de la base [como en Fig. 101] (Subgrupos a veces renocidos como géneros son caracterizados en "Notes.") (Halictidae, Halictinae, Halictini) ..... *Lasioglossum* (parte) [40]

— Vena basal arqueada en forma débil y más bien uniforme o recta [como en Fig. 100] i

i(h). Antenas insertas cerca de la mitad de la cara [Fig. 343]; clípeo con margen superior arqueado hacia arriba, de modo que no es corto y transverso [Fig. 343] (Andrenidae, Andreninae) ..... *Andrena* (parte) [10]

— Antenas insertas muy por abajo de la mitad de la cara [Fig. 331]; clípeo corto, transverso, con margen superior no muy arqueado hacia arriba [Fig. 331] (Halictidae, Rophitinae) ..... ir a 188

LOCATOR 4

Scopa of pollen-carrying hairs well-developed on hind tibia (but not forming a corbicula), reduced or absent on hind femur and trochanter [Fig. 27] (females) (The halictid subfamily Rophitinae is included in this locator as well as in locator 3 because the femoral scopa is sometimes rather weak and smaller than the tibial scopa.) ..... a

a. With three submarginal cells [as in Fig. 24] .....b

— With two submarginal cells [as in Fig. 25] i

b(a). Marginal cell slender, seven times as long as broad and only a little over half as wide as widest submarginal cell [Fig. 191]; stigma absent [Fig. 191] (large, robust bees [Fig. 505]) (Anthophoridae, Xylocopinae, Xylocopini)..... *Xylocopa* [150]

— Marginal cell six times as long as broad or less, much more than half as wide as widest submarginal cell [Fig. 209]; stigma usually distinct..... c

c(b). Outer hind tibial spur absent, inner spur and middle tibial spur coarsely pectinate [Fig. 206] (arolia absent) (Anthophoridae, Anthophorinae, Tetrapediini) (tropical)..... *Tetrapedia* [133]

— Hind tibia with the usual two spurs; tibial spurs simple, i.e., only minutely serrate or ciliate along margins [Fig. 108] .....d

d(c). Pygidial plate absent [Fig. 102]; slender, shiny bees with hairs sparse, not forming metasomal bands [Figs. 503 and 504] (Anthophoridae, Xylocopinae, Ceratinini)..... *Ceratina* [149]

— Pygidial plate present [Fig. 103]; slender to robust, usually hairy, often with metasomal hair bands.... e

e(d). Apex of marginal cell pointed on or very near wing margin [as in Figs. 118 and 119] (Halictidae, Rophitinae, part)..... ..... go to couplet 37, stop with couplet 41

— Apex of marginal cell strongly truncate, or rounded or pointed and bent well away from wing margin [Figs. 87–90]..... f

f(e). Arolia absent [Fig. 204] ..... go to couplet 105

— Arolia present [Fig. 205].....g

g(f). Posterior margin of first submarginal cell at least 1.3 times as long as third [Fig. 237]; body elongate (like *Andrena* [Figs. 421–424] or *Halictus* [Figs. 439 and 440]); proboscis short, segments of labial pal-

LOCALIZADOR 4

Escopa de pelos colectores de polen bien desarrollada sobre la tibia posterior (pero no formando corbícula), reducida o ausente sobre el fémur y trocánter posteriores [Fig. 27] (hembras) (Se incluye la subfamilia de halíctidos Rophitinae en este localizador así como también en el localizador 3 pues la escopa femoral es a veces más bien débil y menor que la escopa tibial.) .....a

a. Con tres celdas submarginales [como en Fig. 24]..... b

— Con dos celdas submarginales [como en Fig. 25]..... i

b(a). Celda marginal angosta, siete veces tan larga como ancha y sólo un poco más de la mitad del ancho de la celda submarginal más ancha [Fig. 191]; estigma ausente [Fig. 191] (abejas grandes, robustas [Fig. 505]) (Anthophoridae, Xylocopinae, Xylocopini) .....*Xylocopa* [150]

— Celda marginal seis veces tan larga como ancha o menos, mucho más de la mitad del ancho de la celda submarginal más ancha [Fig. 209]; estigma usualmente conspicuo c

c(b). Tibia posterior sin espolón externo; espolón interno y espolón tibial medio gruesamente pectinados [Fig. 206] (arolios ausentes) (Anthophoridae, Anthophorinae, Tetrapediini) (tropical).....*Tetrapedia* [133]

— Tibia posterior con los dos espolones usuales; espolones tibiales simples, esto es con los márgenes finamente aserrados o ciliados [Fig. 108] ..... d

d(c). Placa pigidial ausente [Fig. 102]; abejas delgadas y brillantes, con pelos ralos que no forman bandas en el metasoma (Anthophoridae, Xylocopinae, Ceratinini)..... ..... *Ceratina* [149]

— Placa pigidial presente [Fig. 103]; abejas delgadas a robustas, usualmente pilosas, frecuentemente con bandas de pelos en el metasoma.....e

e(d). Celda marginal con ápice en punta sobre o muy cerca del margen alar [como en Figs. 118 y 119] (Halictidae, Rophitinae, parte) .....ir a 37, no pasar de 41

— Celda marginal con ápice fuertemente trunco, o redondeado o aguzado y curvado alejándose del margen alar [Figs. 87–90] ..... f

f(e). Arolios ausentes [Fig. 204]..... ir a 105

— Arolios presentes [Fig. 205] ..... g

g(f). Primera celda submarginal con el margen posterior al menos 1,3 veces tan largo como el de la tercera [Fig. 237]; cuerpo alargado (como *Andrena* [Figs. 421–424] o *Halictus* [Figs. 439 y 440]); proboscis corta, palpo labial

pus similar [as in Fig. 8] or only first elongate (Andrenidae, Panurginae, part) ..... *Protandrena* [18]

— Posterior margin of first submarginal cell little if any longer than third [Fig. 238] (intermediate in *Ancyloscelis, Exomalopsis,* and others, which have unusually short, robust bodies [Figs. 484–486]); body commonly robust [Fig. 473]; proboscis long, first two segments of labial palpus elongate, flattened, entirely different from segments 3 and 4 [Fig. 6] (Anthophoridae, Anthophorinae, part) .. h

h(g). Closed cells of forewing largely hairless [as in Fig. 228]; wing surface beyond veins coarsely papillate and hairless ..... go to couplet 118

— Entire forewing with numerous minute hairs [Fig. 229]; wing surface beyond veins not papillate or if so, many papillae ending in hairs ..... go to couplet 126

i(a). Marginal cell beyond stigma on costa little if any longer than stigma *and* second submarginal cell less than two-thirds as long as first [Fig. 306] (see footnote to couplet 173) (Andrenidae, Panurginae, part) ..... *Perdita* (part) [17]

— Marginal cell beyond stigma on costa longer than stigma or, *if not,* then second submarginal cell two-thirds as long as first or longer [Fig. 324] (see footnote to couplet 173) ..... j

j(i). Apex of marginal cell pointed on costa or separated from costa by only one or two vein widths [Figs. 83–86]; stigma large (see couplet 26 for details) ..k

— Apex of marginal cell rounded, truncate, or pointed and separated from costa by distance equal to several vein widths [as in Figs. 87–90]; stigma usually small (see couplet 26 for details) l

k(j). Antennal bases well below middle of face and separated from clypeus by little if any more than diameter of antennal socket [Figs. 109 and 110]; clypeus short, transverse, its upper margin not much arched up into face; pre-episternal groove present [Fig. 59] (Halictidae, Rophitinae, part) ..... go to couplet 188

— Antennal bases near middle of face [Fig. 111] or, if below, separated from clypeus by much more than diameter of antennal socket; clypeus strongly arched up into face, so that it is not short and trans-

con segmentos similares [como en Fig. 8] o sólo el primero alargado (Andrenidae, Panurginae, parte) ..... *Protandrena* [18]

— Primera celda submarginal con el margen posterior poco o nada más largo que el de la tercera [Fig. 238] (intermedio en *Ancyloscelis, Exomalopsis,* y así sucesivamente, que tienen cuerpo robusto, más corto que lo usual [Figs. 484–486]); cuerpo comúnmente robusto [Fig. 473]; proboscis larga, palpo labial con los dos primeros segmentos alargados, planos, enteramente diferentes de los segmentos 3 y 4 [Fig. 6] (Anthophoridae, Anthophorinae, parte) ..... h

h(g). Celdas cerradas del ala anterior mayormente glabras [como en Fig. 228]; superficie alar, después de las venas, sin pelos y con papilas gruesas ..... ir a 118

— Toda el ala anterior con numerosos pelitos pequeños [Fig. 229]; superficie del ala después de las venas no papilosa o, si fuese así, muchas de las papilas con pelo terminal ..... ir a 126

i(a). Celda marginal sobre el margen costal después del estigma poco o nada más larga que éste, *y* segunda celda submarginal menos de dos tercios del largo de la primera [Fig. 306] (ver nota en la alternativa 173) (Andrenidae, Panurginae, parte) ..... *Perdita* (parte) [17]

— Celda marginal después del estigma más larga que éste o, *si no,* entonces segunda celda submarginal dos tercios o más tan larga como la primera [Fig. 324] (ver nota en la alternativa 173) ..... j

j(i). Celda marginal con ápice en punta sobre el margen alar o separado de éste por sólo una o dos veces el grueso de una vena [como en Figs. 83–86]; estigma grande (ver 26 para detalles) ..... k

— Celda marginal con ápice redondeado, trunco, o en punta pero separado del margen por varias veces el grosor de una vena [como en Figs. 87–90]; estigma usualmente pequeño (ver 26 para detalles) l

k(j). Bases antenales muy por abajo de la mitad de la cara y separadas del clípeo por poco o nada más de una diámetro alveolar [Figs. 109 y 110]; clípeo corto, transverso, margen superior no muy arqueado hacia arriba; surco pre-episternal presente [Fig. 59] (Halictidae, Rophitinae, parte) ..... ir a 188

— Bases antenales cerca de la mitad de la cara [Fig. 111] o, si por debajo, separadas del clípeo por mucho más de un

verse [Fig. 111]; pre-episternal groove absent (Melittidae, part)..... go to couplet 194

l(j). Jugal lobe of hind wing less, usually much less, than two-thirds as long as vannal lobe [Fig. 349]; first two segments of labial palpus long, sheathlike, unlike segments 3 and 4 [as in Fig. 6] (Anthophoridae, Anthophorinae, Exomalopsini, part)..... ..... *Exomalopsis* (part) [120]

— Jugal lobe of hind wing at least nearly three-fourths as long as vannal lobe [Fig. 350]; first two segments of labial palpus not long and sheathlike, either all four segments similar or only first segment elongate [as in Fig. 8] (Andrenidae, Panurginae)..... ..... go to couplet 228

diámetro alveolar; clípeo con margen superior fuertemente arqueado hacia arriba, de modo que no es corto y transverso [Fig. 111]; surco pre-episternal ausente (Melittidae, parte)..... ir a 194

l(j). Lóbulo yugal del ala posterior menos, y usualmente mucho menos, de dos tercios del largo del lóbulo vanal [Fig. 349]; palpo labial con los dos primeros segmentos largos, planos, diferentes de los segmentos 3 y 4 [como en Fig. 6] (Anthophoridae, Anthophorinae, Exomalopsini, parte) ..... *Exomalopsis* (parte) [120]

— Lóbulo yugal del ala posterior al menos tres cuartos tan largo como el lóbulo vanal [Fig. 350]; palpo labial con los dos primeros segmentos no largos y planos, los cuatro segmentos similares o sólo el primero alargado [como en Fig. 8] (Andrenidae, Panurginae)..... ir a 228

LOCATOR 5

Scopa absent (on both hind legs and metasomal sterna) (females) .....a

a. Hind tibial spurs absent [as in Fig. 54]; venation reduced [as in Figs. 32 and 33; see couplet 1 of "Key to the Genera"] (Apidae, Meliponinae, part) (tropical)..... *Lestrimelitta* [160]

— Hind tibial spurs present [as in Fig. 55]; venation not reduced [as in Fig. 35; see couplet 1 of "Key to the Genera"] .....b

b(a). Three submarginal cells [as in Fig. 24] c

— Two submarginal cells (rarely only one) [as in Fig. 25] .....j

c(b). Large [Figs. 510–515]; brilliantly metallic green, blue, or purple; with proboscis in repose extending beyond base of metasoma; comb of bristles in position of jugal lobe of hind wing [Fig. 65] (Apidae, Euglossinae, part) (tropical)..... go to couplet 21

— Usually smaller; usually not brilliantly metallic; proboscis in repose not reaching metasoma; jugal lobe of hind wing usually present [Figs. 91 and 92], never replaced by comb of bristles .....d

d(c). Jugal lobe of hind wing absent; large, *Bombus*-like bees [Figs. 508 and 509] (Apidae, Bombinae, part) .....*Psithyrus* [153]

— Jugal lobe of hind wing present [Figs. 91 and 92]; usually smaller, not *Bombus*-like .....e

LOCALIZADOR 5

Escopa ausente (tanto en las patas posteriores cómo en los esternos del metasoma) (hembras) .....a

a. Espolones tibiales posteriores ausentes [como en Fig. 54]; venación reducida [como en Figs. 32 y 33; ver alternativa 1 de "Clave para los Géneros"] (Apidae, Meliponinae, parte) (tropical)..... *Lestrimelitta* [160]

— Espolones tibiales posteriores presentes [como en Fig. 55]; venación no reducida [como en Fig. 35; ver alternativa 1 de "Clave para los Géneros"] ..... b

b(a). Tres celdas submarginales [como en Fig. 24].....c

— Dos celdas submarginales (rara vez sólo una) [como en Fig. 25] .....j

c(b). Grande [Figs. 510–515]; verde, azul, o púrpura metálico brillante; con proboscis en reposo sobrepasando la base del metasoma; con un peine de setas en lugar del lóbulo yugal del ala posterior [Fig. 65] (Apidae, Euglossinae, parte) (tropical).....ir a 21

— Usualmente menor; usualmente no metálico brillante; proboscis en reposo no alcanzando el metasoma; lóbulo yugal del ala posterior usualmente presente [Figs. 91 y 92], nunca substituido por un peine de setas..... d

d(c). Lóbulo yugal del ala posterior ausente; grande, con apariencia de *Bombus* [Figs. 508 y 509] (Apidae, Bombinae, parte) ..... *Psithyrus* [153]

— Lóbulo yugal del ala posterior presente [Figs. 91 y 92]; usualmente menor, sin apariencia de *Bombus*.....e

e(d). Marginal cell pointed on costal margin of wing or nearly so [Figs. 83 and 86] (see couplet 26 for details) ..... f

— Marginal cell with apex rounded, truncate, or, if pointed, with apex bent well away from costa [Figs. 87–90] (see couplet 26 for details) ..... g

f(e). Basal vein arcuate or subangulate near base [Fig. 119] (Halictidae, Halictinae, part) ..... go to couplet 50

— Basal vein straight or gently curved [as in Fig. 118] ..... go to couplet 28

g(e). Middle tibial spur notched, bifid, or multidentate at apex [Figs. 194 and 195] (Anthophoridae, Anthophorinae, Ericrocidini) ..... go to couplet 96

— Middle tibial spur ending in a simple, sharp point [Fig. 196] ..... h

h(g). Arolia absent [as in Fig. 204]; marginal cell less than twice as long as stigma and not exceeding third submarginal cell [Fig. 208] (Anthophoridae, Anthophorinae, Melectini, part) .... *Zacosmia* [126]

— Arolia present [as in Fig. 205]; marginal cell longer, extending beyond third submarginal cell [Fig. 219] i

i(h). Pygidial plate distinct [as in Fig. 235] ..... go to couplet 109

— Pygidial plate unrecognizable (Anthophoridae, Anthophorinae, Protepeolini) (rare, SW) ..... *Leiopodus* [130]

j(b). Marginal cell beyond stigma little if any longer than stigma *and* second submarginal cell less than two-thirds as long as first [as in Fig. 306] (sometimes second submarginal cell absent) (Anthophoridae, Nomadinae, Neolarrini) ..... *Neolarra* [142]

— Marginal cell beyond stigma longer than stigma or, *if not,* second submarginal cell two-thirds as long as first or longer [as in Fig. 307] ..... k

k(j). Second submarginal cell little, if any, more than half as long as first or rarely three-fifths as long [Fig. 310]; first recurrent vein received by first submarginal cell or meeting first transverse cubital [Fig. 310], rarely beyond it ..... go to couplet 176

— Second submarginal cell at least two-thirds as long as first and receiving first recurrent vein [Fig. 311] l

e(d). Celda marginal en punta sobre o casi sobre el margen alar [Figs. 83 y 86] (ver 26 para detalles) ..... f

— Celda marginal con ápice redondeado, trunco, o, si en punta curvado, alejándose del margen alar [Figs. 87–90] (ver 26 para detalles) ..... g

f(e). Vena basal arqueada o subangulosa cerca de la base [Fig. 119] (Halictidae, Halictinae, parte) ..... ir a 50

— Vena basal recta o suavemente curva [como en Fig. 118] ..... ir a 28

g(e). Apice del espolón tibial medio con una muesca, bífido, o multidentado [Figs. 194 y 195] (Anthophoridae, Anthophorinae, Ericrocidini) ..... ir a 96

— Espolón tibial medio con punta simple y aguda [Fig. 196] ..... h

h(g). Arolios ausentes [como en Fig. 204]; celda marginal menos de dos veces del largo del estigma y no sobrepasando la tercera celda submarginal [Fig. 208] (Anthophoridae, Anthophorinae, Melectini, parte) ..... *Zacosmia* [126]

— Arolios presentes [como en Fig. 205]; celda marginal larga, sobrepasando la tercera celda submarginal [Fig. 219] i

i(h). Placa pigidial conspicua [como en Fig. 235] ..... ir a 109

— Placa pigidial irreconocible (Anthophoridae, Anthophorinae, Protepeolini, parte) (raro, SW).... *Leiopodus* [130]

j(b). Celda marginal después del estigma poco o nada más larga que éste *y* segunda celda submarginal menos de dos tercios del largo de la primera [como en Fig. 306] (a veces segunda celda submarginal ausente) (Anthophoridae, Nomadinae, Neolarrini) ..... *Neolarra* [142]

— Celda marginal después del estigma más larga que éste o, *si no,* segunda celda submarginal dos tercios del largo de la primera o más [como en Fig. 307] ..... k

k(j). Segunda celda submarginal poco o nada más larga que la mitad de la primera o raramente tres quintos del largo [Fig. 310]; primera vena recurrente unida a la primera celda submarginal o intersticial con la primera transversa cubital [Fig. 310], raramente después de ésta..... ir a 176

— Segunda celda submarginal al menos dos tercios del largo de la primera y recibiendo la primera vena recurrente [Fig. 311] l

l(k). Axila proyectada posteriormente en un lóbulo, ángulo, o espina roma lateral al escutelo [Fig. 319] ..... ir a 181

— Axila redondeada lateral y posteriormente, sin proyec-

l(k). Axilla produced posteriorly to a lobe, angle, or blunt spine lateral to scutellum [Fig. 319] ..... go to couplet 181

— Axilla rounded lateroposteriorly with no projection, continuing contour of scutellar margin ..... m

m(l). Basal vein strongly arcuate near base [as in Fig. 323] (Halictidae, Halictinae, Halictini, part) ..... *Sphecodes* (part) [47]

— Basal vein gently and rather uniformly arcuate or straight [Fig. 324] ..... n

n(m). Marginal cell not or scarcely exceeding submarginal cells [as in Fig. 351] (Anthophoridae, Anthophorinae, Melectini) (rare, "Nevada") ..... *Brachymelecta* [123]

— Marginal cell extending beyond submarginal cells [Figs. 352 and 353] ..... o

o(n). Apex of marginal cell obliquely truncate, i.e., bent sharply away from wing margin [as in Fig. 352] (Anthophoridae, Nomadinae, Ammobatini) ..... *Oreopasites* [134]

— Apex of marginal cell on wing margin or gradually bent from wing margin, pointed or narrowly rounded [as in Fig. 353] ..... p

p(o). Labrum much broader than long [Fig. 356] (Anthophoridae, Nomadinae) ..... q

— Labrum longer than broad [Fig. 357] (Megachilidae, Megachilinae, Anthidiini) ..... r

q(p). Apex of marginal cell pointed on or almost on wing margin [as in Figs. 83 and 86] ..... go to couplet 191

— Apex of marginal cell somewhat rounded, separated from wing margin [Fig. 90] ..... go to couplet 201

r(p). Middle tibia with one apical spine [as in Fig. 363]; mandible with large basal projection ..... *Hoplostelis* [68]

— Middle tibia with two spines at apex on outer side [Fig. 362] (for small specimens, examine in distal view); mandible without basal projection ..... go to couplet 205

ción, continuando el contorno del margen del escutelo .. m

m(l). Vena basal fuertemente arqueada cerca de la base [como en Fig. 323] (Halictidae, Halictinae, Halictini, part) ..... *Sphecodes* (parte) [47]

— Vena basal suave y más bien uniformemente arqueada o recta [Fig. 324] ..... n

n(m). Celda marginal apenas o no sobrepasando las celdas submarginales [Fig. 351] (Anthophoridae, Anthophorinae, Melectini) (raro, "Nevada") .... *Brachymelecta* [123]

— Celda marginal sobrepasando más allá de las celdas submarginales [Figs. 352 y 353] ..... o

o(n). Celda marginal con ápice oblicuamente trunco, esto es, bruscamente alejado del margen alar [como en Fig. 352] (Anthophoridae, Nomadinae, Ammobatini) ..... *Oreopasites* [134]

— Apice de la celda marginal sobre el margen alar o alejándose gradualmente del margen alar, aguzado o estrechamente redondeado [Fig. 353] ..... p

p(o). Labro mucho más ancho que largo [Fig. 356] (Anthophoridae, Nomadinae) ..... q

— Labro más largo que ancho [Fig. 357] (Megachilidae, Megachilinae, Anthidiini) ..... r

q(p). Apice de la celda marginal agudo, sobre o casi sobre el margen alar [como en Figs. 83 y 86] ..... ir a 191

— Apice de la celda marginal algo redondeado, separado del margen alar [Fig. 90] ..... ir a 201

r(p). Tibia media con una espina apical [como en Fig. 363]; mandíbula con proyección basal grande ..... *Hoplostelis* [68]

— Tibia media con dos espinas apicales en la superficie externa [Fig. 362] (examinar ejemplares pequeños en vista distal); mandíbula sin proyección basal ..... ir a 205

LOCATOR 6

Basal vein of forewing strongly arcuate or subangulate near base [Fig. 28]; *T5 of females (except in parasitic genera) with longitudinal median zone or triangular area of short, dense hairs, or minute, dense punctation (and sometimes with a slit) dividing the prepygidial fimbria* [Fig. 29]; *T6 of females ordinarily completely hidden by T5* (Halictidae, Halictinae) ..... a

a. Three submarginal cells [as in Fig. 52] ..... go to couplet 48

— Two submarginal cells [as in Fig. 53] ..... go to couplet 185

LOCALIZADOR 6

Vena basal del ala anterior fuertemente arqueada o subangulosa cerca de la base [Fig. 28]; *T5 de la hembra (excepto en abejas parásitas) con una zona longitudinal media o área triangular con pelos cortos y densos o con puntuación fina y densa (y a veces con una hendidura) dividiendo la fimbria prepigidial* [Fig. 29]; T6 de las hembras por lo común completamente oculto por T5 (Halictidae, Halictinae) ..... a

a. Tres celdas submarginales [como en Fig. 52] ..... ir a 48

— Dos celdas submarginales [como en Fig. 53] ..... ir a 185

LOCATOR 7

Arolia absent [compare Figs. 30 and 31] ..... a

a. Three submarginal cells [Fig. 52] ..... b

— Two submarginal cells [Fig. 53] (Megachilidae, part) ..... d

b(a). Jugal lobe of hind wing absent, sometimes replaced by bristles [Fig. 65] (Apidae, Bombinae and Euglossinae) ..... go to couplet 19

— Jugal lobe of hind wing present [as in Figs. 66 and 91] c

c(b). Middle tibial spur notched, bifid, or multidentate at apex [Figs. 194 and 195] (Anthophoridae, Anthophorinae, Ericrocidini) (arolia present in *Ctenioschelus*) ..... go to couplet 96

— Middle tibial spur ending in a simple, sharp point [Fig. 196] ..... g

d(a). Eyes hairy [Fig. 321] (Megachilinae, Megachilini) ..... *Coelioxys* [76]

— Eyes bare ..... e

e(d). Mandible tridentate, middle tooth longer and more elevated than others [Fig. 347]; outer surfaces of tibiae with numerous coarse spicules not bearing hairs or bristles [Fig. 348] (Lithurginae) ..... female of *Lithurge* [60]

— Mandible simple or with lower tooth longest [Figs. 371 and 372], number of teeth variable; outer surfaces of tibiae not spiculate or, if so, with bristle arising from apex of each (Megachilinae) ..... f

f(e). Thorax and/or metasoma with yellow or white (rarely red) integumental markings or rarely entire

LOCALIZADOR 7

Arolios ausentes [compare Figs. 30 y 31] ..... a

a. Tres celdas submarginales [Fig. 52] ..... b

— Dos celdas submarginales [Fig. 53] (Megachilidae, parte) ..... d

b(a). Lóbulo yugal del ala posterior ausente, a veces reemplazado por cerdas [Fig. 65] (Apidae, Bombinae and Euglossinae) ..... ir a 19

— Lóbulo yugal del ala posterior presente [como en Figs. 66 y 91] c

c(b). Apice del espolón tibial medio con una muesca, bífido, o multidentado [Figs. 194 y 195] (Anthophoridae, Anthophorinae, Ericrocidini) (arolios presentes en *Ctenioschelus*) ..... ir a 96

— Apice del espolón tibial medio con punta simple y aguda [Fig. 196] ..... g

d(a). Ojos pilosos [Fig. 321] (Megachilinae, Megachilini) ..... *Coelioxys* [76]

— Ojos glabros ..... e

e(d). Mandíbula tridentada, diente medio más largo y más elevado que los otros [Fig. 347]; superficie externa de las tibias con numerosas espículas fuertes que no llevan pelos o setas [Fig. 348] (Lithurginae) ..... hembra de *Lithurge* [60]

— Mandíbula simple o el diente inferior el más largo [Figs. 371 y 372], número de dientes variable; superficie externa de las tibias no espiculada o, si con espículas, éstas terminan en una seta apical (Megachilinae) ..... f

f(e). Tórax y/o metasoma con manchas amarillas o blancas (rara vez rojas) en el tegumento o raramente

body red with black or yellowish markings (Anthidiini) ..... go to couplet 208

— Thorax and metasoma without integumental markings, black or metallic or metasoma alone red (rarely terga with narrow apical cream-colored margins) ..... h

g(c). Marginal cell slender, seven times as long as broad and only a little over half as wide as widest submarginal cell [Fig. 192]; stigma absent [Fig. 192] (large, robust bees) (Oxaeidae) ..... go to couplet 94

— Marginal cell six times as long as broad or less, much more than half as wide as widest submarginal cell [Fig. 209]; stigma usually distinct [Fig. 209] (Anthophoridae, Anthophorinae, part)..... ..... go to couplet 103

h(f). Margin of stigma in first submarginal cell shorter than or about as long as width of stigma [Fig. 390]; claws of female cleft or with inner preapical tooth [as in Figs. 367 and 368]; clypeus and paraocular area of male usually yellow or cream-colored (Subgroups, sometimes recognized as genera, are characterized in "Notes.") (Anthidiini)..... ..... *Trachusa* (part) [74]

— Margin of stigma in first submarginal cell longer than width of stigma [Fig. 391]; claws of female simple or with basal tooth; clypeus and paraocular areas not yellow or cream-colored (Subgroups, sometimes recognized as genera, are characterized in "Notes.") (Megachilini)..... *Megachile* [77]

todo el cuerpo rojo con manchas negras o amarillentas (Anthidiini) ..... ir a 208

— Tórax y metasoma sin manchas en el tegumento, negros o metálicos o sólo el metasoma rojo (raramente margen apical de los tergos con una banda angosto color crema) ..... h

g(c). Celda marginal angosta, siete veces tan larga como ancha y sólo poco más de la mitad del ancho de la celda submarginal más ancha [Fig. 192]; estigma ausente [Fig. 192] (abejas grandes, robustas) (Oxaeidae) .....ir a 94

— Celda marginal seis veces o menos tan larga como ancha, mucho más de la mitad del ancho de la celda submarginal más ancha [Fig. 209]; estigma usualmente conspicuo [Fig. 209] (Anthophoridae, Anthophorinae, parte).... ir a 103

h(f). Margen del estigma sobre la primera celda submarginal más corto o aproximadamente tan largo como el ancho del estigma [Fig. 390]; uñas de la hembra bífidas o con diente preapical interno [como en Figs. 367 y 368]; clípeo y área paraocular del macho usualmente amarillo o color crema (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") (Anthidiini)..... ..... *Trachusa* (parte) [74]

— Margen del estigma sobre la primera celda submarginal más largo que el ancho del estigma [Fig. 391]; uñas de la hembra simples o con diente basal; clípeo y área paraocular sin amarillo o color crema (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") (Megachilini)..... *Megachile* [77]

Key to the Genera of North and Central America

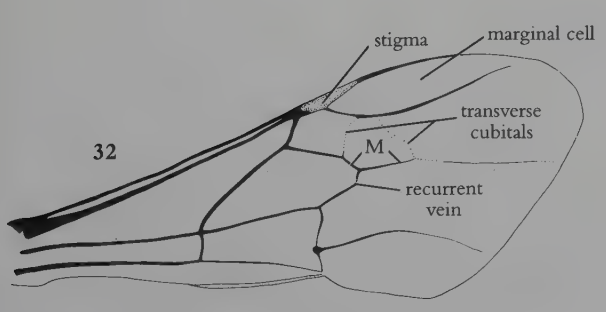
Clave para los Géneros de América del Norte y Central

1. Transverse cubital veins and second recurrent vein weak compared with other veins, commonly absent [Figs. 32–34]; marginal cell open [Fig. 32] or closed by weakened vein [Fig. 33]; hind tibial spurs absent [Figs. 38 and 39] (Apidae, Meliponinae) (tropical) 2

— Veins well developed, conspicuous; marginal cell closed by strong vein [Fig. 35]; hind tibial spurs present [Fig. 55], except in *Apis* [Fig. 54] and males of *Eulonchopria* and *Coelioxoides* 12

1. Venas transversas cubitales y segunda recurrente débiles comparadas con otras venas, comúnmente ausentes [Figs. 32–34]; celda marginal abierta [Fig. 32] o cerrada por una vena débil [Fig. 33]; espolones tibiales posteriores ausentes [Figs. 38 y 39] (Apidae, Meliponinae) (tropical) 2

— Venas bien desarrolladas, conspicuas; celda marginal cerrada por una vena fuerte [Fig. 35]; espolones tibiales posteriores presentes [Fig. 55], excepto en *Apis* [Fig. 54] y en machos de *Eulonchopria* y *Coelioxoides* 12



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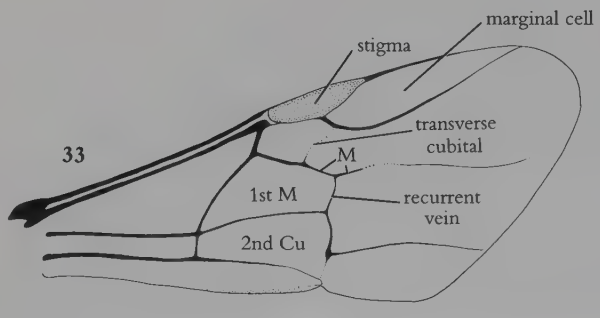

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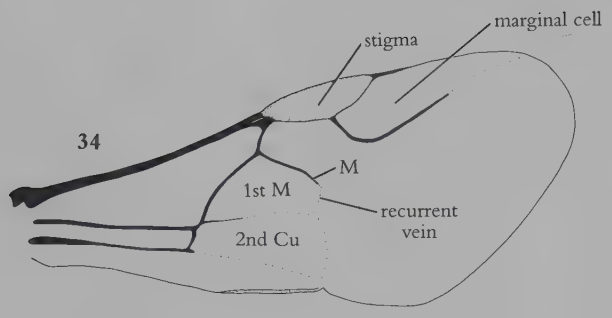
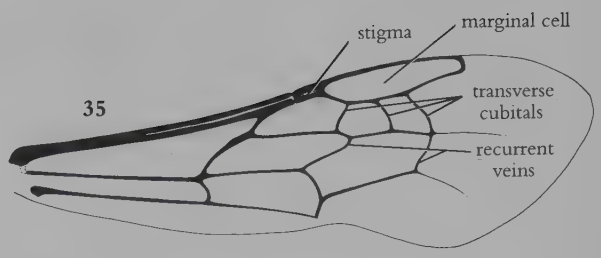


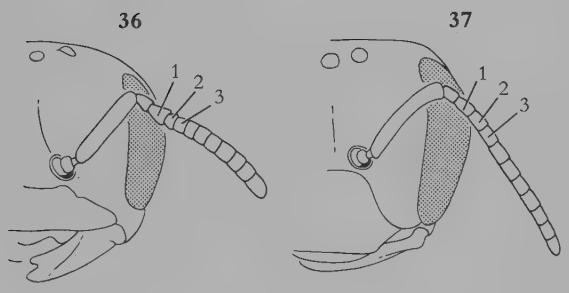


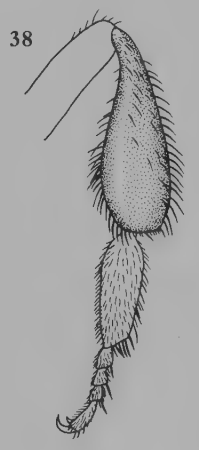
2(1). First flagellar segment of female nearly as long as second and third together [Fig. 36], of males slightly shorter than second; rear tibia of workers without shiny corbicula fringed with hairs [Fig. 38] (uncommon) ..... *Lestrimelitta* [160]

— First flagellar segment of female shorter (usually much shorter) than second and third together [Fig. 37], of males usually at least twice length of second; rear tibia of workers depressed apically, shiny, forming a corbicula margined with hairs [Fig. 39].....3

2(1). Primer flagelómero de la hembra casi tan largo como el segundo y el tercero juntos [Fig. 36], en los machos algo más corto que el segundo; obreras con tibia posterior sin corbícula brillante rodeada de pelos [Fig. 38] (poco común) ..... *Lestrimelitta* [160]

— Primer flagelómero de la hembra más corto que el segundo y el tercero juntos (usualmente mucho más corto) [Fig. 37], en los machos usualmente al menos el doble del largo del segundo; obreras con tibia posterior deprimida apicalmente, brillante, formando una corbícula rodeada de pelos [Fig. 39] 3





3(2). Stigma slender, its margin within marginal cell usually straight or concave [Fig. 32]; wings not or slightly exceeding metasoma; thorax with abundant hair, in some areas as long as tegula .... *Melipona* [161]

— Stigma rather broad, its margin within marginal cell distinctly convex [Fig. 33]; wings considerably ex-

3(2). Estigma alar angosto, su borde dentro de la celda marginal recto o cóncavo [Fig. 32]; alas no excediendo o excediendo escasamente el metasoma; tórax con pelos abundantes, en algunas áreas tan largos como la tégula..... .....*Melipona* [161]

— Estigma alar más bien ancho, su borde dentro de la celda marginal distintamente convexo [Fig. 33]; alas excediendo

ceeding metasoma; thorax with relatively sparse hair, shorter than tegula.....4

4(3). Vein M of forewing ending abruptly at point of union with first recurrent vein (which is unpigmented) [Fig. 34]; marginal cell wide open apically except for unpigmented line [Fig. 34]; cells 1st M and 2nd Cu open except for unpigmented lines; body length usually 3 mm or less (uncommon) .... *Trigonisca* [169]

— Vein M of forewing bent apicad at, and continued beyond, point of union with first recurrent vein [Fig. 33]; marginal cell narrowed or closed by pigmented vein; cells 1st M and 2nd Cu closed or largely so by pigmented veins [Fig. 33]; body length usually 3 mm or more* 5

5(4). Clypeus rather uniformly punctured, distinctly more coarsely so than frons, separated from eye by distance much greater than length of malar area [Fig. 47].....6

— Clypeus entirely impunctate, with large impunctate areas, or punctate like frons; clypeus separated from eye by distance little if any greater than length of malar area [Figs. 45 and 46].....7

6(5). Dorsum of head and thorax dull with exceedingly dense, fine punctation; mandible with a single large tooth at upper end of apical margin, separated by shallow emargination from rest of mandibular margin [Fig. 47] (uncommon)..... *Cephalotrigona* [159]

— Dorsum of head and thorax shiny with well-separated minute punctures; mandible with two small denticles at upper end of apical margin [as in Fig. 45] (rare)..... *Oxytrigona* [163]

7(5). Hind tibia slender, posterior margin with plumose hairs (sometimes sparse and inconspicuous in subgenus *Geotrigona*) in addition to simple hairs [Fig. 40]; inner surface of hind tibia with longitudinal ridge (covered with keirotrichia) narrower than or about as wide as shining depressed zone behind

considerablemente el metasoma; tórax con pelos relativamente esparcidos, más cortos que la tégula 4

4(3). Vena M del ala anterior terminada abruptamente en el punto de unión con la primera vena recurrente (la cual es no pigmentada) [Fig. 34]; celda marginal apicalmente ampliamente abierta, excepto por una línea no pigmentada [Fig. 34]; celdas 1ª M y 2ª Cu abiertas, excepto por la presencia de líneas no pigmentadas; largo del cuerpo usualmente 3 mm o menos (poco común)..... ..... *Trigonisca* [169]

— Vena M del ala anterior curvada apicalmente junto al punto de unión con la primera vena recurrente y sobrepasando este punto [Fig. 33]; celda marginal angostada o cerrada por una vena pigmentada; celdas 1ª M y 2ª Cu cerradas o casi cerradas por venas pigmentadas [Fig. 33]; largo del cuerpo usualmente 3 mm o más*..... 5

5(4). Clípeo con puntuación más bien uniforme y distintamente más gruesa que en la frente, separado del ojo por una distancia mucho mayor que el largo del área malar [Fig. 47]..... 6

— Clípeo con extensas áreas no puntuadas, enteramente sin puntuación, o puntuado como la frente; clípeo separado del ojo por una distancia poco o nada mayor que el largo del área malar [Figs. 45 y 46] 7

6(5). Dorso de cabeza y tórax opacos, con puntuación fina y sumamente densa; mandíbula con un solo diente grande en el extremo superior del margen apical, separado por una emarginación leve del resto del margen [Fig. 47] (poco común) ..... *Cephalotrigona* [159]

— Dorso de cabeza y tórax brillantes, con puntos diminutos bien separados; mandíbula con dos dientecitos en el extremo superior del margen apical [como en Fig. 45] (raro) .....*Oxytrigona* [163]

7(5). Tibia posterior delgada, margen posterior con pelos plumosos (a veces inconspicuos y escasos en el subgénero *Geotrigona*) a más de pelos simples [Fig. 40]; superficie interna de la tibia posterior con una elevación media longitudinal (cubierta con keirotrichia) casi tan ancha como la zona deprimida brillante detrás de ésta [Fig. 41]

*The rest of the key for Meliponinae is based on workers and does not always work for queens and males, which, however, are usually found in association with workers.

*El resto de la clave para Meliponinae está basado en obreras y no siempre funciona para reinas y machos, los cuales sin embargo son usualmente encontrados en asociación con obreras.

ridge [Fig. 41] (Subgroups sometimes recognized as genera are characterized in "Notes.").. *Trigona* [168]

— Hind tibia more robust, posterior margin with simple hairs only [Fig. 42]; inner surface of hind tibia with broad zone of keirotrichia reaching posterior margin or separated from it by narrow shining margin [Fig. 43] 8

8(7). Thorax and head smooth and shiny, sometimes punctate but interspaces shiny, so that surface is dulled, if at all, only by hairs 9

— Thorax and usually head with surface distinctly dulled by dense punctures, pits, or tessellation 10

9(8). Hind tibia greatly expanded [Fig. 44], about half as wide as long, concavity of outer surface extending almost to base, anterior margin almost as convex as posterior margin..... *Partamona* [165]

— Hind tibia much less expanded [Fig. 42], concavity not approaching base, anterior margin not or scarcely convex (Subgroups sometimes recognized as genera are characterized in "Notes.")..... ..... *Plebeia* [166]

(Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") ..... *Trigona* [168]

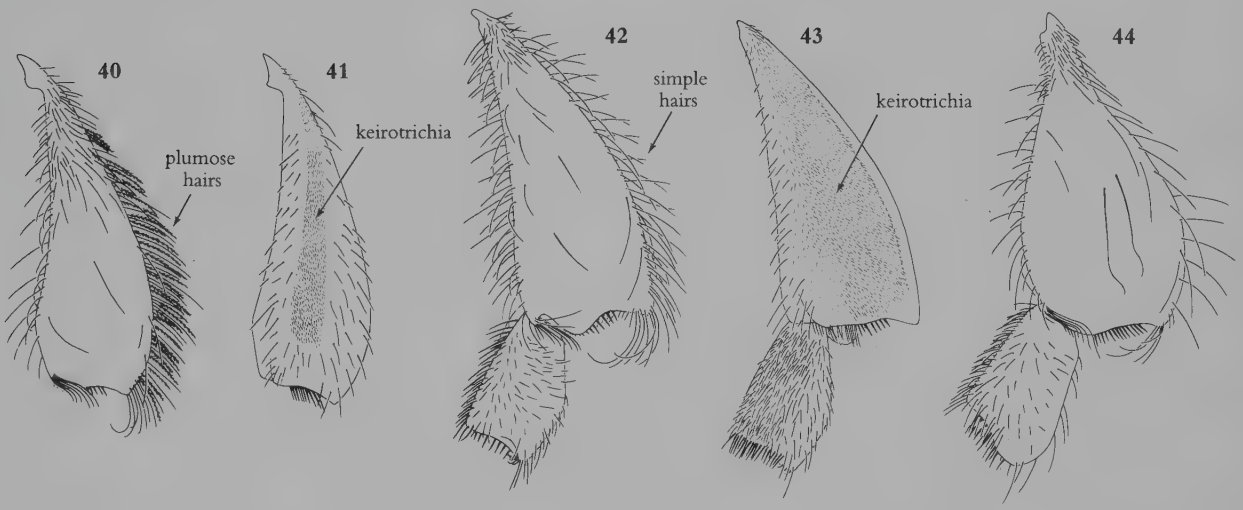
— Tibia posterior más robusta, margen posterior sólo con pelos simples [Fig. 42]; superficie interna de la tibia posterior con zona ancha de keirotrichia alcanzando el margen posterior o separada de éste por un angosto margen brillante [Fig. 43] 8

8(7). Tórax y cabeza lisos y brillantes, a veces puntuados pero los interespacios brillantes, de modo que el brillo es apagado, cuanto más, solamente por pelos..... 9

— Tórax y usualmente la cabeza con superficie distintamente opaca, con puntos densos, hoyuelos, o teselada 10

9(8). Tibia posterior muy expandida [Fig. 44], su ancho más o menos la mitad del largo, concavidad de la superficie externa extendiéndose casi hasta la base, margen anterior casi tan convexo como el posterior ..... *Partamona* [165]

— Tibia posterior mucho menos expandida [Fig. 42], concavidad no aproximándose a la base, margen anterior escasamente o no convexo (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") .... *Plebeia* [166]

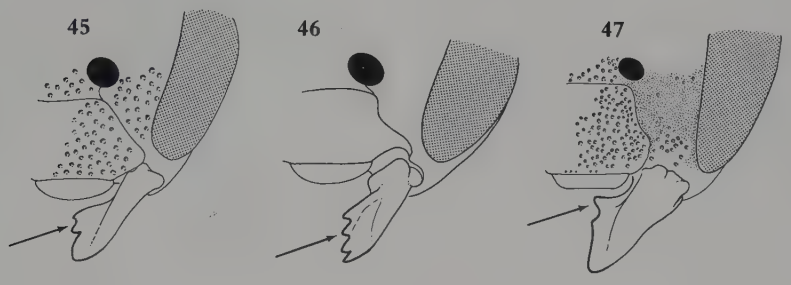


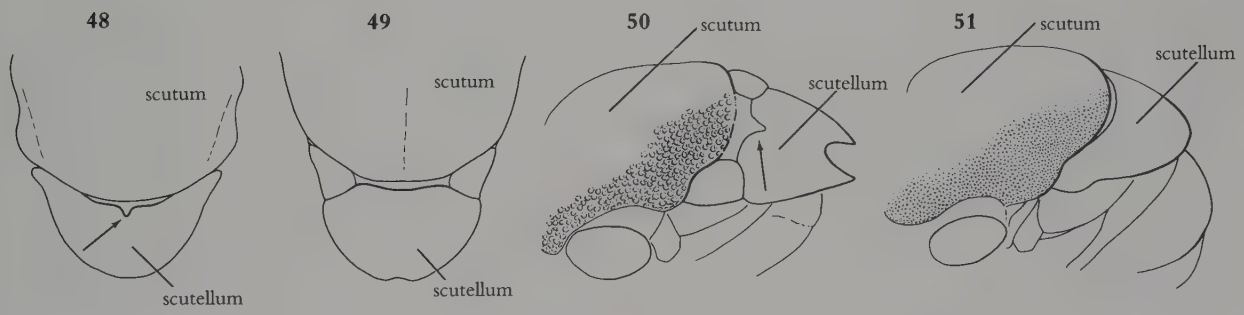
10(8). Apical margin of mandible more or less clearly quadridentate, dentition sometimes obscured by intervening septa [Fig. 46]; anterior margin of scutellum without median depression [Fig. 49] (rare)..... ..... *Paratrigona* [164]

10(8). Margen apical de la mandíbula más o menos claramente cuadridentado, a veces entre los dientes con tabiques que confunden la dentición [Fig. 46]; margen anterior del escutelo sin depresión media [Fig. 49] (raro) .... *Paratrigona* [164]

— Apical margin of mandible with two small teeth at upper end, otherwise edentate [Fig. 45]; anterior margin of scutellum with small, shiny, V-shaped or U-shaped median depression [Figs. 48 and 50] ... 11

— Margen apical de la mandíbula con dos dientecitos en el extremo superior, el resto edentado [Fig. 45]; margen anterior del escutelo con una depresión pequeña en forma de V o de U [Figs. 48 y 50] 11





11(10). Posterior margin of scutellum strongly overhanging propodeum, with median apical emargination [Fig. 50]; thorax coarsely punctate ..... *Nannotrigona* [162]

— Posterior margin of scutellum not hiding propodeum, rounded, without median apical emargination [Fig. 51]; thorax tessellate to minutely punctate ..... *Scaptotrigona* [167]

12(1). With three submarginal cells [Fig. 52]; rarely second transverse cubital incomplete, so that second and third submarginal cells are partly united 13

— With two submarginal cells [Fig. 53], rarely only one 173

13(12). Hind tibial spurs absent [Fig. 54]; eyes hairy [as in Fig. 321] (Apidae, Apinae) ..... *Apis* [151]

— Hind tibial spurs present [Fig. 55] except in males of *Eulonchopria* and *Coelioxoides,* which have bare eyes 14

11(10). Margen posterior del escutelo sobresaliendo por encima del propodeo pronunciadamente, con una emarginación apical media [Fig. 50]; tórax fuertemente puntuado ..... *Nannotrigona* [162]

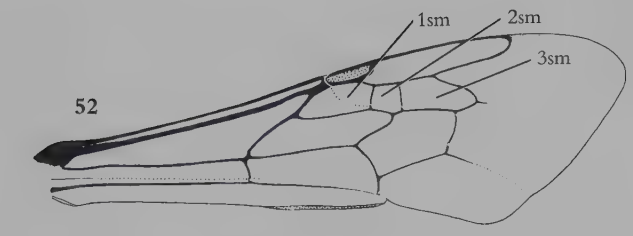
— Margen posterior del escutelo no ocultando el propodeo, redondeado, sin emarginación apical media [Fig. 51]; tórax teselado a finamente puntuado ..... *Scaptotrigona* [167]

12(1). Con tres celdas submarginales [Fig. 52]; raramente segunda vena transversa cubital incompleta, de modo que las celdas submarginales segunda y tercera se unen parcialmente 13

— Con dos celdas submarginales [Fig. 53], raramente una sola 173

13(12). Espolones tibiales posteriores ausentes [Fig. 54]; ojos pilosos [como en Fig. 321] (Apidae, Apinae) ..... *Apis* [151]

— Espolones tibiales posteriores presentes [Fig. 55], excepto en machos de *Eulonchopria* y *Coelioxoides,* cuyos ojos son glabros 14



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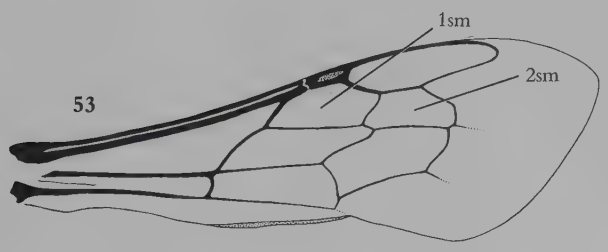

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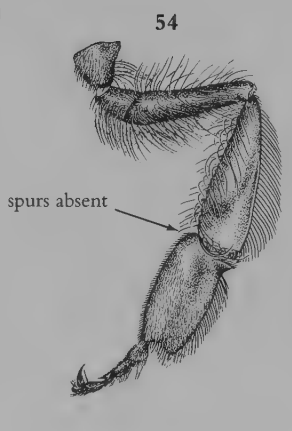

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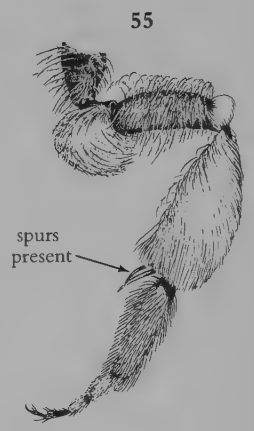

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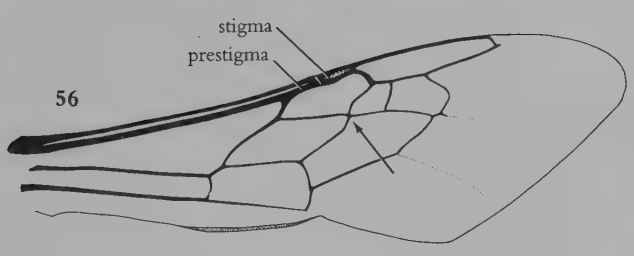
14(13). First recurrent vein meeting *first* transverse cubital [Fig. 56] or within one or two vein widths of it; stigma no wider than prestigma measured to wing margin [Fig. 56] (Colletidae, Diphaglossinae, part) 15

— First recurrent vein far beyond first transverse cubital [Fig. 57], often near or distal to second transverse cubital; stigma often wider than prestigma [Fig. 57] but highly variable (if first recurrent vein near first transverse cubital, as in some *Mydrosoma,* wing length under 12 mm) 18

14(13). Venas primera recurrente y primera transversa cubital intersticiales [Fig. 56] o separadas por una o dos veces su grosor; estigma no más ancho que el prestigma medido hasta el margen alar [Fig. 56] (Colletidae, Diphaglossinae, parte) 15

— Primera vena recurrente bien después de la primera transversa cubital [Fig. 57], a menudo cerca o distal a la segunda transversa cubital; estigma frecuentemente más ancho que el prestigma [Fig. 57] pero muy variable (si las venas primera recurrente y primera transversa cubital están próximas, como en algunas *Mydrosoma,* largo alar menos de 12 mm) 18



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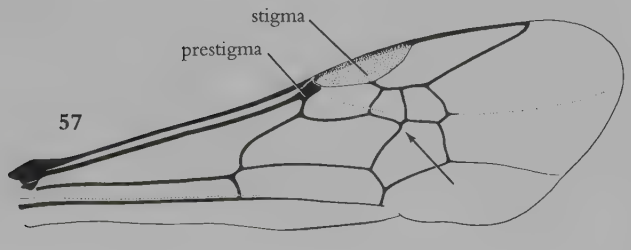

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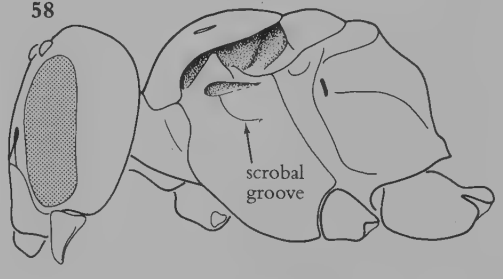

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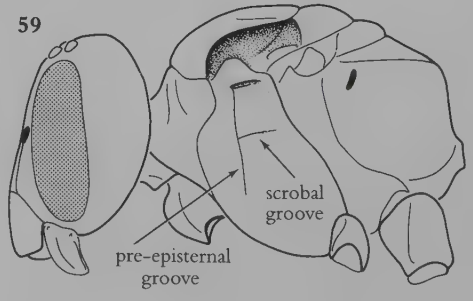


15(14). Pre-episternal groove absent below scrobal groove [as in Fig. 58]; forewing length under 12 mm (Dissoglottini, part) (rare, tropical) .... *Mydrosoma* (part) [6]

— Pre-episternal groove extending far below scrobal groove [as in Fig. 59]; forewing length usually over 13 mm (Caupolicanini) 16

16(15). Outer hind tibial spur of male immovably fused to tibia [Fig. 60]; hind basitarsus of female about twice as long as broad [Fig. 61], second hind tarsal segment broader than main longitudinal axis [Fig. 61]; metasomal terga usually weakly metallic greenish or bluish (uncommon, tropical to SW) .... *Ptiloglossa* [5]

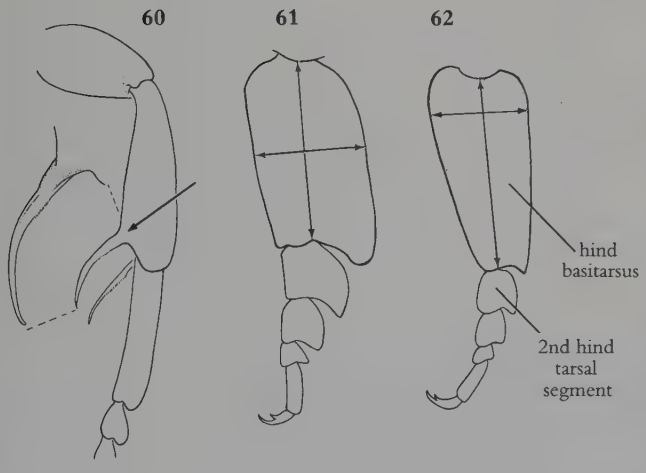
— Outer hind tibial spur of male articulated at base like inner spur; hind basitarsus of female more than twice as long as broad [Fig. 62], second hind tarsal segment longer than broad [Fig. 62]; metasomal terga nonmetallic 17

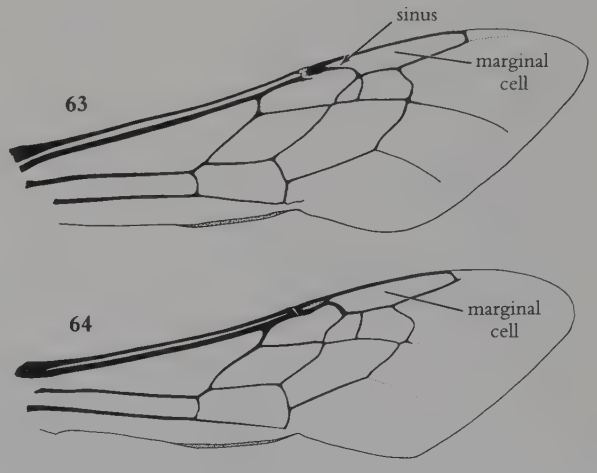
15(14). Surco pre-episternal ausente por debajo del surco escrobal [como en Fig. 58]; largo del ala anterior menos de 12 mm (Dissoglottini, parte) (raro, tropical) .... *Mydrosoma* (parte) [6]

— Surco pre-episternal extendiéndose bien por debajo del surco escrobal [como en Fig. 59]; largo del ala anterior usualmente más de 13 mm (Caupolicanini) 16

16(15). Tibia posterior del macho con espolón externo fusionado, inmóvil [Fig. 60]; basitarso posterior de la hembra aproximadamente dos veces tan largo como ancho [Fig. 61], segundo segmento del tarso posterior más ancho que su eje máximo longitudinal [Fig. 61]; tergos del metasoma usualmente con débil color metálico verdoso o azulado (poco común, tropical a SW) ..... *Ptiloglossa* [5]

— Tibia posterior del macho con espolón externo articulado en la base, semejante al interno; basitarso posterior de la hembra más de dos veces tan largo como ancho [Fig. 62], segundo segmento del tarso posterior más largo que ancho [Fig. 62]; tergos del metasoma no metálicos 17





17(16). Base of marginal cell prolonged as narrow sinus to apex of stigma [Fig. 63]; S7 of male without paired apical lobes (rare, Mesoamerica) .... *Crawfordapis* [4]

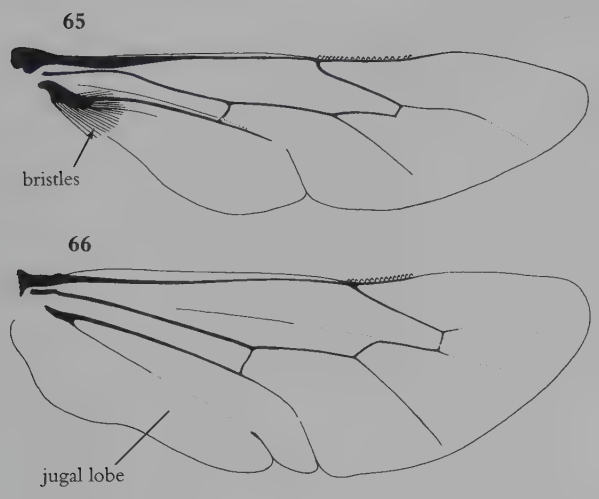
— Base of marginal cell not sinus-like [Fig. 64]; S7 of male with paired apical lobes..... *Caupolicana* [3]

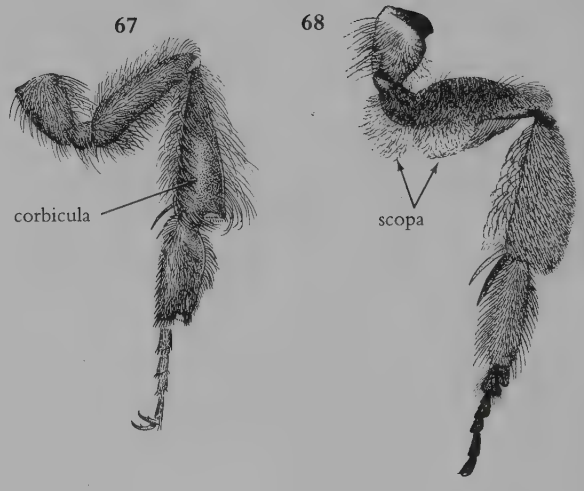
18(14). Jugal lobe of hind wing absent, sometimes replaced by bristles [Fig. 65]; females (except in para-

17(16). Base de la celda marginal forma un angosto seno frente al estigma [Fig. 63]; S7 del macho sin lóbulos apicales (raro, Mesoamérica) ..... *Crawfordapis* [4]

— Base de la celda marginal sin formar un seno angosto [Fig. 64]; S7 del macho con lóbulos apicales pares..... ..... *Caupolicana* [3]

18(14). Lóbulo yugal del ala posterior ausente, a veces reemplazado por cerdas [Fig. 65]; hembras (excepto los géneros





sitic genera *Psithyrus, Aglae,* and *Exaerete*) with corbicula on hind tibia formed from large, smooth, flat or concave area surrounded by fringe of long scopal hairs [Fig. 67]; arolia absent [Fig. 31].....19

— Jugal lobe of hind wing present [Fig. 66]; corbicula on hind tibia absent [Fig. 68]; arolia variable but sometimes present [Fig. 30].....25

19(18). Proboscis in repose reaching beyond base of metasoma; body usually at least partially metallic; deep, hairy groove on posterior surface of hind tibia of male [Figs. 69, 70, and 72]; a comb of bristles in position of jugal lobe of hind wing [Fig. 65] (Apidae, Euglossinae) (tropical).....20

— Proboscis in repose not reaching base of metasoma; body not metallic; posterior tibia of male not deeply grooved; no comb of bristles on base of hind wing (Apidae, Bombinae).....24

20(19). Hind tibia of both sexes not over 1.5 times as broad as femur [Fig. 72], that of female without corbicula.....21

— Hind tibia of both sexes over twice as broad as femur [Figs. 69 and 70], that of female with corbicula 22

21(20). Scutellum with a tubercle on each side [Fig. 71]; hind femur usually denticulate beneath [Fig. 72]; metasomal terga and sterna without longitudinal median carina (rare) .....*Exaerete* [158]

— Scutellum flat, not tuberculate; hind femur not den-

parásitos *Psithyrus, Aglae,* y *Exaerete*) con corbícula en la tibia posterior formada por un área grande, lisa, y plana o cóncava, orlada de largos pelos escopales [Fig. 67]; arolios ausentes [Fig. 31].....19

— Lóbulo jugal del ala posterior presente [Fig. 66]; corbícula en la tibia posterior ausente [Fig. 68]; arolios variables, a veces presentes [Fig. 30].....25

19(18). Proboscis en reposo sobrepasando la base del metasoma; cuerpo usualmente metálico, al menos parcialmente; tibia posterior del macho con profundo surco piloso sobre la superficie posterior [Figs. 69, 70, y 72]; con hilera de setas en lugar del lóbulo yugal del ala posterior [Fig. 65] (Apidae, Euglossinae) (tropical).....20

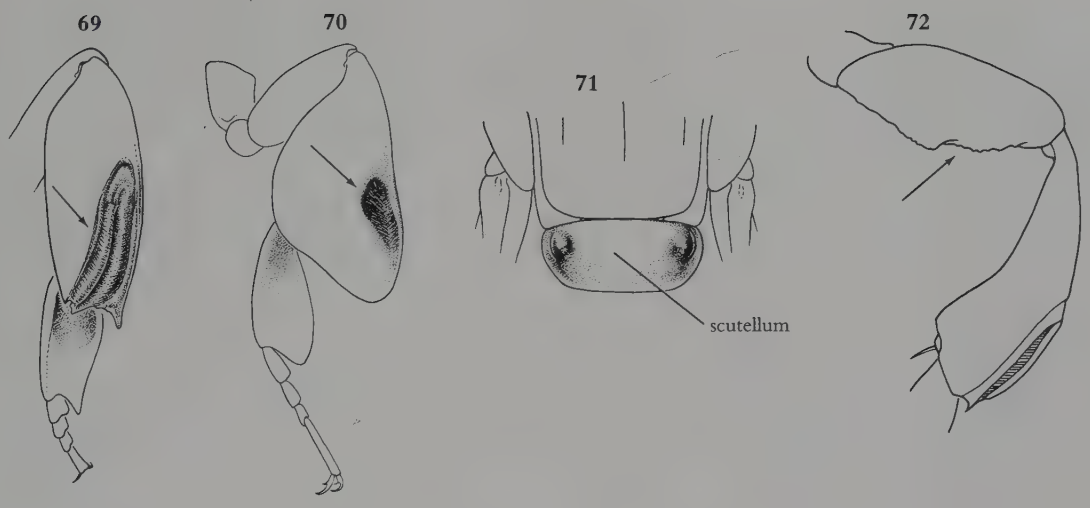
— Proboscis en reposo no alcanzando la base del metasoma; cuerpo no metálico; tibia posterior del macho sin surco profundo; sin hilera de setas en la base del ala posterior (Apidae, Bombinae).....24

20(19). Tibia posterior en ambos sexos no más de 1,5 veces tan ancha como el fémur [Fig. 72], la de la hembra sin corbícula.....21

— Tibia posterior en ambos sexos más de dos veces tan ancha como el fémur [Figs. 69 y 70], la de la hembra con corbícula.....22

21(20). Escutelo con un tubérculo a cada lado [Fig. 71]; fémur posterior usualmente denticulado por debajo [Fig. 72]; tergos y esternos del metasoma sin carena longitudinal media (raro).....*Exaerete* [158]

— Escutelo plano, sin tubérculos; fémur posterior no denti-



ticulate; metasomal terga (especially 3 to 6) and sterna 2 to 4 (also 5 in female) with longitudinal median carina (very rare).....*Aglae* [154]

22(20). Labrum, mandible, and lower lateral portion of clypeus whitish; body usually brilliantly metallic; posterior tibia of male with hairy groove not reaching rounded apex of tibia [Fig. 70]; middle tibia of male with one to three minute velvety patches at the proximal end of the large patch [Fig. 73] .....*Euglossa* [156]

— Labrum, mandible, and lower lateral portion of clypeus dark; body usually black or slightly metallic, sometimes brilliantly so; posterior tibia of male with hairy groove reaching apex of tibia between two strong teeth or spines [Fig. 69]; middle tibia of male

culado; tergos del metasoma (especialmente 3 a 6) y esternos 2 a 4 (también 5 en la hembra) con carena longitudinal media (muy raro).....*Aglae* [154]

22(20). Labro, mandíbula, y porción lateral inferior del clípeo blanquecinos; cuerpo usualmente metálico brillante; tibia posterior del macho con surco piloso no alcanzando el ápice redondeado de la tibia [Fig. 70]; tibia media del macho con una a tres áreas aterciopeladas muy pequeñas en el extremo basal del área mayor [Fig. 73] ....*Euglossa* [156]

— Labro, mandíbula, y porción lateral inferior del clípeo oscuros; cuerpo usualmente negro o débilmente metálico, a veces metálico intenso; tibia posterior del macho con surco piloso alcanzando el ápice entre dos fuertes dientes o espinas [Fig. 69]; tibia media del macho con un área

with one elongate velvety patch adjacent to or within proximal part of larger patch [Fig. 74].....23

23(22). Labial palpus two-segmented; face nonmetallic, commonly with white marks on clypeus (uncommon)..... *Eulaema* [157]

— Labial palpus four-segmented; face metallic (sometimes only faintly so); clypeus without white marks (uncommon)..... *Eufriesea* [155]

24(19). Posterior tibia of female with large, shining, concave corbicula surrounded by long hairs [Fig. 75]; outer surface of hind tibia of male with large, sparsely haired, shiny area; volsella dark, somewhat sclerotized, and not or scarcely exceeding apex of gonostylus [Fig. 77]..... *Bombus* [152]

— Posterior tibia of female convex and hairy [Fig. 76]; outer surface of hind tibia of male with abundant short, dark hairs; volsella membranous, extending far beyond gonostylus [Fig. 78] (uncommon)..... .....*Psithyrus* [153]

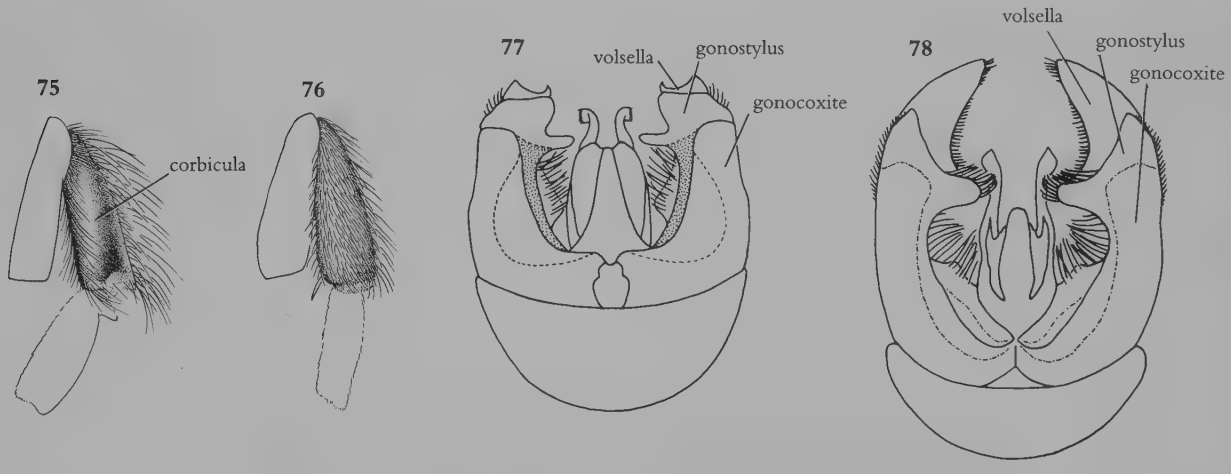
aterciopelada alargada adyacente a, o dentro de, la parte basal del área mayor [Fig. 74]..... 23

23(22). Palpo labial con dos segmentos; cara no metálica, clípeo comúnmente con manchas blancas (poco común)..... .....*Eulaema* [157]

— Palpo labial con cuatro segmentos; cara metálica (a veces sólo débilmente); clípeo sin manchas blancas (poco común).....*Eufriesea* [155]

24(19). Tibia posterior de la hembra con corbícula grande, cóncava, y brillante rodeada de largos pelos [Fig. 75]; superficie externa de la tibia posterior del macho con un área brillante, grande, con pelos ralos; volsella oscura, dura, frecuentemente corta y apenas sobrepasando el gonostilo [Fig. 77] ..... *Bombus* [152]

— Tibia posterior de la hembra convexa y pilosa [Fig. 76]; superficie externa de la tibia posterior del macho con abundantes pelos cortos, oscuros; volsella membranosa, sobrepasando ampliamente el gonostilo [Fig. 78] (poco común)..... *Psithyrus* [153]



25(18). Posterior portion of second recurrent vein distinctly arcuate distad [Fig. 79]; eyes usually strongly convergent below [Fig. 81] (Colletidae, Colletinae, part)..... *Colletes* [1]

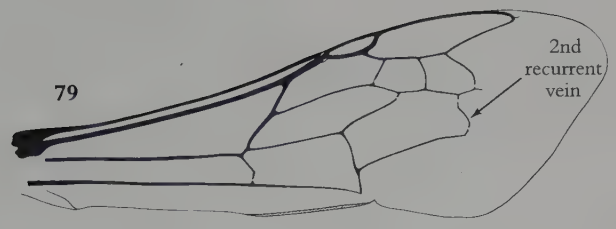
— Posterior portion of second recurrent vein not arcuate distad [as in Fig. 80]; eyes variable, often subparallel [as in Fig. 82].....26

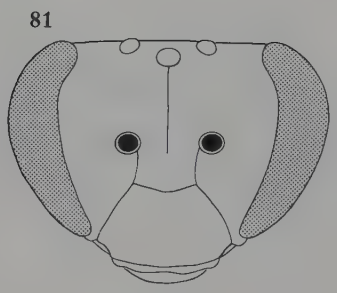
26(25). Marginal cell pointed [Fig. 83] (or sometimes rounded as in Nomiinae [Fig. 84], in *Chelostoma,*

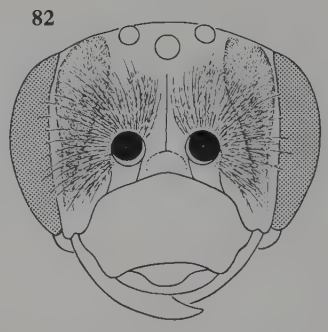
25(18). Porción posterior de la segunda vena recurrente distintamente arqueada distalmente [Fig. 79]; ojos compuestos por lo común fuertemente convergentes abajo [Fig. 81] (Colletidae, Colletinae, parte) ..... *Colletes* [1]

— Porción posterior de la segunda vena recurrente no arqueada hacia afuera [como en Fig. 80]; ojos compuestos variable, frecuentemente subparalelos [como en Fig. 82] 26

26(25). Celda marginal con ápice en punta [Fig. 83] (a veces redondeado como en Nomiinae [Fig. 84], en *Chelostoma,*

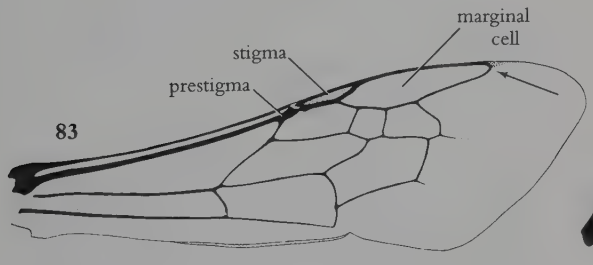


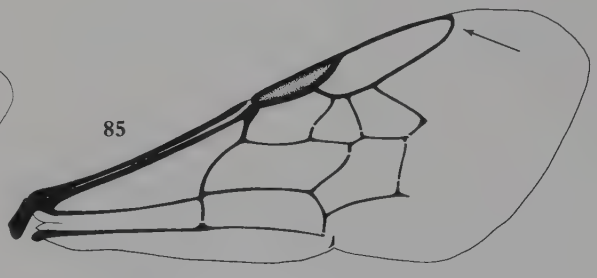


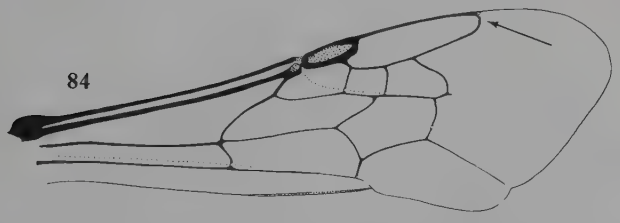


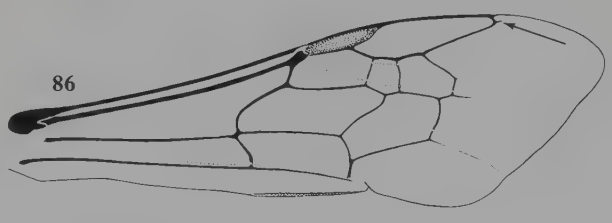
and often in *Ceratina* [Fig. 85]*), apex on costal margin of wing or, if bent away from margin or truncated, apex less than about three vein widths (of vein Rs on posterior side of cell) from costal margin [Fig. 83]; stigma usually large, usually broader and much longer than prestigma, margin within marginal cell usually convex (Some halictids have marginal cell minutely truncate at apex, but stigma is large [Fig. 86].) 27

y frecuentemente en *Ceratina* [Fig. 85]*), ápice junto al margen costal del ala o, si alejado o trunco, no alejado por más de tres veces el grosor de la vena Rs (medida sobre el lado posterior de la celda marginal); estigma usualmente grande, en general más ancho y mucho más largo que el prestigma, borde dentro de la celda marginal usualmente convexo (algunos halíctidos con ápice de la celda marginal brevemente truncado, pero estigma grande [Fig. 86]) 27



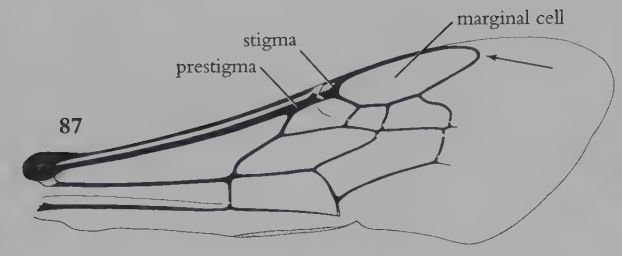






*These three taxa can be run to either couplet 27 or couplet 91.

*Con estos tres taxa se puede ir tanto a 27 como a 91.



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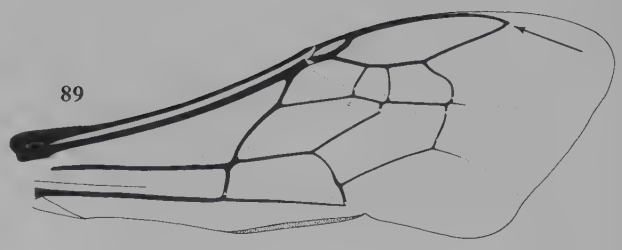

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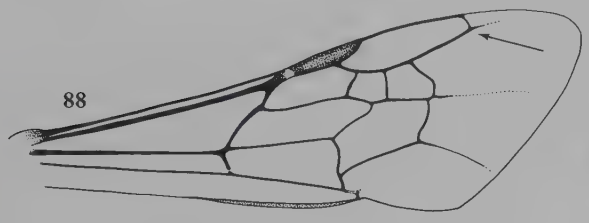

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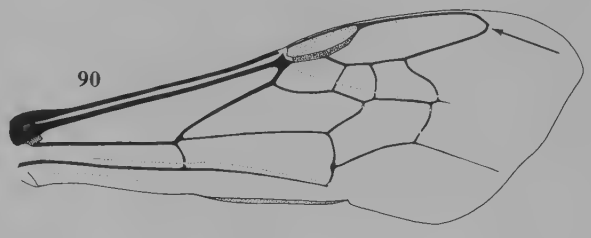

90

— Marginal cell with apex rounded [Fig. 87], truncate [Fig. 88], or, if pointed, apex bent well away from costal margin, so that it is three or more vein widths from costal margin [Fig. 89]; stigma commonly small, rarely broader than prestigma, usually little if any longer than prestigma, margin within marginal cell usually straight or concave (Exomalopsines [Fig. 90], epeolines, and others go here in spite of large stigmata because of the apex of the marginal cell.).. 91

27(26). Jugal lobe of hind wing very small, less than one-third as long as vannal lobe measured from wing base [Fig. 91]; scopa absent; first two segments of labial palpus elongate, flat, unlike last two segments [Fig. 6].....28

— Jugal lobe of hind wing at least one-third as long as vannal lobe [Fig. 92]; scopa of female usually present; labial palpal segments similar, more or less cylindrical [as in Fig. 8], except in *Ceratina*.....34

— Celda marginal con ápice redondeado [Fig. 87], trunco [Fig. 88], o, si en punta, alejado del margen costal por tres o más veces el grosor de la vena [Fig. 89]; estigma comúnmente pequeño, raramente más ancho que el prestigma, usualmente poco o nada más largo que el prestigma, borde dentro de la celda marginal usualmente recto o cóncavo (Exomalopsinos [Fig. 90], epeolinos, y otros con estigma grande van aquí debido al ápice de la celda marginal.)..... 91

27(26). Lóbulo yugal del ala posterior muy pequeño, menos de un tercio del largo del lóbulo vanal (medido desde la base del ala) [Fig. 91]; escopa ausente; palpo labial con los dos primeros segmentos alargados, planos, distintos de los dos últimos segmentos [Fig. 6] 28

— Lóbulo yugal del ala posterior al menos un tercio del largo del lóbulo vanal [Fig. 92]; escopa de la hembra usualmente presente; palpo labial con segmentos similares, más o menos cilíndricos [como en Fig. 8], excepto en *Ceratina*..... 34

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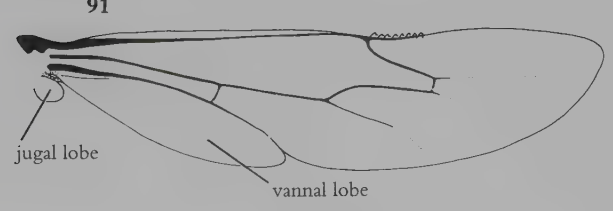

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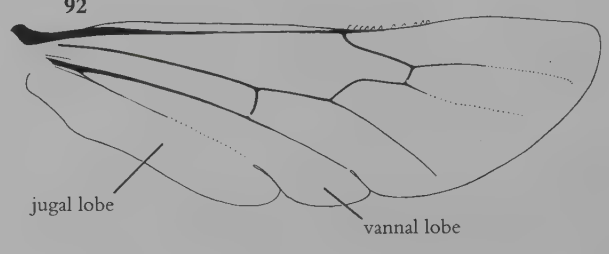


28(27). Mesepisternum seen from side with ventral portion slanting and approximately parallel to profile of propodeum [Fig. 93]; S6 of female exposed, without processes, lobes, or spinelike setae [Fig. 95]; integument smooth, largely impunctate, without areas of dense pubescence (Anthophoridae, Anthophorinae, Osirini, part) (rare, tropical) 29

— Mesepisternum with posterior ventral portion horizontal [Fig. 94], at an angle to propodeal profile; S6 of female retracted, with only apical processes or lobes bearing coarse, spinelike setae exposed; integument punctate or, if largely smooth, with areas of dense pubescence (Anthophoridae, Nomadinae, Nomadini, part) 30

29(28). Dorsolateral angle of pronotum a bulging convexity [Fig. 93] with anteroposterior dimension greater than or equal to genal width; mandible with two preapical teeth; S6 of female long and tubular [Fig. 95], much exceeding T6 ..... *Osiris* [128]

— Dorsolateral angle of pronotum much smaller, anteroposterior dimension about half of genal width; mandible simple or with one preapical tooth; S6 of female only slightly exceeding T6 .... *Protosiris* [129]

30(28). Integument almost entirely polished and impunctate; thorax flattened, greatest width nearly twice height (rare, SW) ..... *Paranomada* [146]

— Integument at least largely punctate; thorax not unusually flattened 31

28(27). Mesepisterno en vista lateral con la porción ventral oblicua y aproximadamente paralela al perfil del propodeo [Fig. 93]; S6 de la hembra expuesto, sin procesos, lóbulos, o setas espiniformes [Fig. 95]; tegumento liso, mayormente impuntuado, sin áreas de pubescencia densa (Anthophoridae, Anthophorinae, Osirini, parte) (raro, tropical) 29

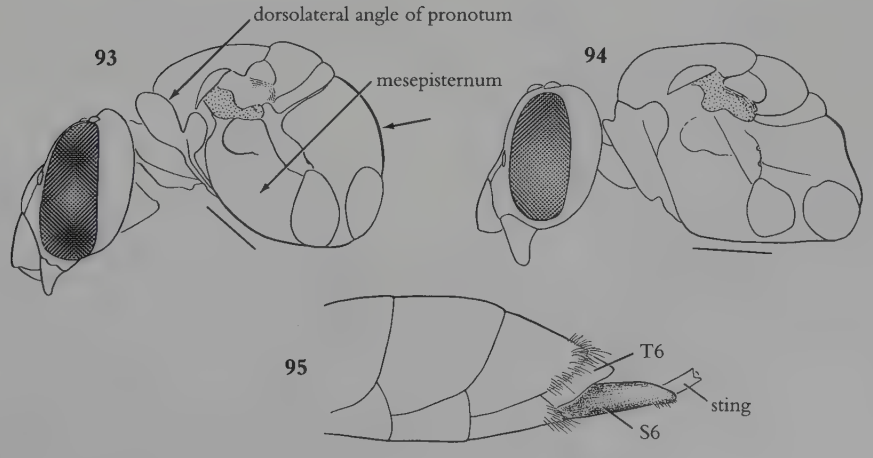
— Mesepisterno con la porción ventral horizontal [Fig. 94], en ángulo con el perfil del propodeo; S6 de la hembra retraído, sólo expuestos procesos o lóbulos apicales con setas gruesas, como espinas; tegumento puntuado o, si extensamente liso, con áreas de pubescencia densa (Anthophoridae, Nomadinae, Nomadini, parte) 30

29(28). Angulo dorsolateral del pronoto convexo, sobresaliente [Fig. 93], su dimensión anteroposterior mayor que, o igual a, el ancho de la gena; mandíbula con dos dientes preapicales; S6 de la hembra largo y tubular [Fig. 95], excediendo bastante T6 ..... *Osiris* [128]

— Angulo dorsolateral del pronoto más pequeño, su dimensión anteroposterior aproximadamente la mitad del ancho de la gena; mandíbula simple o con un diente preapical; S6 de la hembra excediendo sólo un poco T6 ..... *Protosiris* [129]

30(28). Tegumento casi completamente liso e impuntuado; tórax deprimido, su ancho máximo casi dos veces el largo (raro, SW) ..... *Paranomada* [146]

— Tegumento considerablemente puntuado; tórax usualmente no deprimido 31



31(30). Apical portion of marginal cell bent away from wing margin [as in Fig. 79]; profile of T1 with anterior surface curving gradually onto dorsal surface (rare, SW) 32

— Apical portion of marginal cell on wing margin or nearly so [as in Fig. 80]; profile of T1 a single, gentle curve, so that anterior and dorsal surfaces are not recognizable 33

32(31). Over 8 mm in length; metasomal terga with unbroken apical pubescent fasciae [Fig. 96] ..... *Hexepeolus* (part) [143]

— Under 6 mm in length; metasomal terga with pubescent fasciae broken medially [Fig. 97] ..... *Triopasites* [147]

33(31). Vertex and mesoscutum largely impunctate; middle coxa as long as distance from summit to hind wing base [Fig. 98] (rare, W) ..... *Melanomada* (part) [144]

— Vertex and mesoscutum ordinarily punctate; middle coxa shorter than distance from summit to hind wing base [Fig. 99] ..... *Nomada* (part) [145]

34(27). Shiny, hairs short and sparse, not forming metasomal bands; clypeus of female usually with short, lon-

31(30). Apice de la celda marginal alejado del margen alar [como en Fig. 79]; perfil de T1 con superficie anterior curvándose gradualmente hacia la superficie dorsal (raro, SW) 32

— Apice de la celda marginal sobre o casi sobre el borde del ala [como en Fig. 80]; perfil de T1 formando una sola curva uniforme, de modo que las superficies anterior y dorsal no se diferencian 33

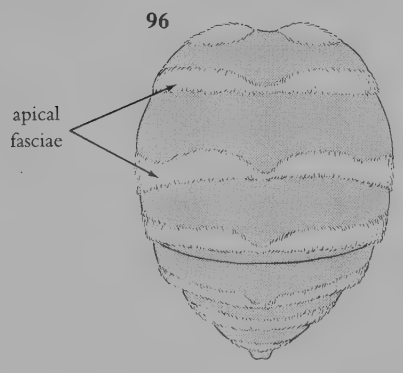
32(31). Largo más de 8 mm; tergos del metasoma con bandas pubescentes apicales no interrumpidas [Fig. 96] ..... *Hexepeolus* (parte) [143]

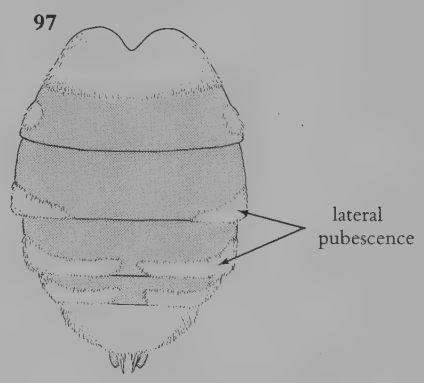
— Largo menos de 6 mm; tergos del metasoma con bandas pubescentes interrumpidas al medio [Fig. 97] ..... *Triopasites* [147]

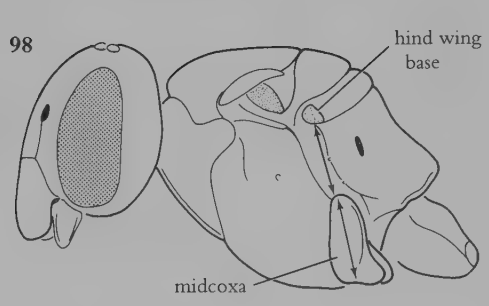
33(31). Vértex y escudo mayormente impuntuados; coxa media tan larga como la distancia entre su límite superior y la base del ala posterior [Fig. 98] (raro, W) ..... *Melanomada* (parte) [144]

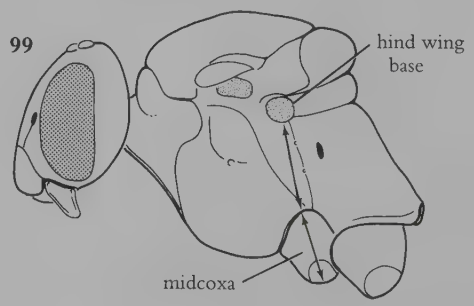
— Vértex y escudo ordinariamente puntuados; coxa media más corta que la distancia entre su límite superior y la base del ala posterior [Fig. 99] ..... *Nomada* (parte) [145]

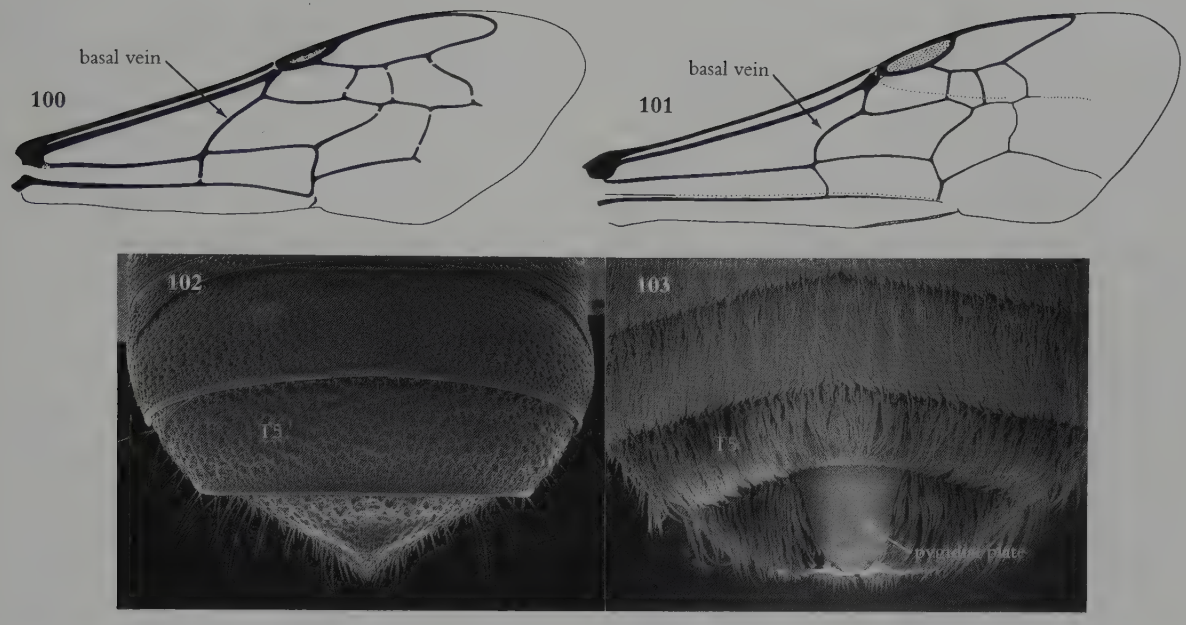
34(27). Tegumento brillante, pelos cortos y ralos, sin bandas en el metasoma; clípeo de la hembra usualmente con una











gitudinal median white or yellow bar; basal vein gently and uniformly curved [Fig. 100]; pygidial plate absent but apex of T6 of female pointed [Fig. 102]; long-tongued bees with first two segments of labial palpus elongate and flattened, unlike last two [as in Fig. 6] (Anthophoridae, Xylocopinae, Ceratinini, part) ..... *Ceratina* (part) [149]

— Usually hairier forms, often with metasomal bands of hair; clypeus of female without longitudinal median pale bar; if body shiny and without bands, basal part of basal vein strongly curved [Fig. 101]; pygidial

barra media longitudinal corta, blanca o amarilla; vena basal curvada en forma suave y uniforme [Fig. 100]; placa pigidial ausente pero el ápice de T6 de la hembra en punta [Fig. 102]; abejas de lengua larga, primeros dos segmentos del palpo labial largos y planos, distintos a los dos últimos [como en Fig. 6] (Anthophoridae, Xylocopinae, Ceratinini, parte) ..... *Ceratina* (parte) [149]

— Formas usualmente más pilosas, metasoma frecuentemente con bandas de pelos; clípeo de la hembra sin barra media longitudinal clara; cuando brillante y sin bandas, vena basal con la parte basal fuertemente curvada [Fig.

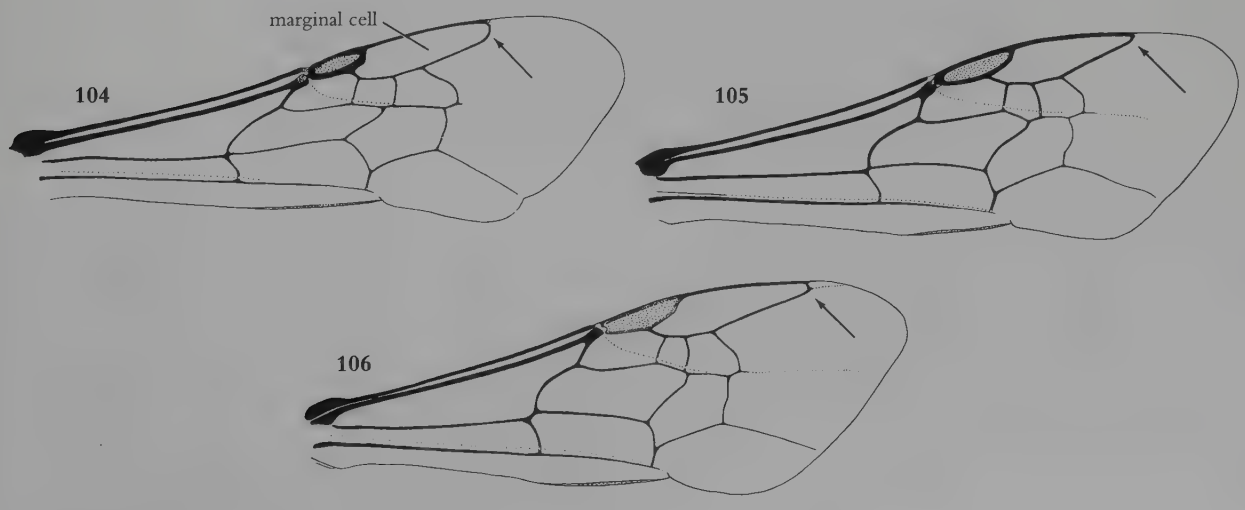


plate of female and many males present [Fig. 103], that of female often hidden under T5; labial palpal segments, or at least last three of them, similar, not long and flattened [as in Fig. 8] 35

35(34). Apex of marginal cell rounded [Fig. 104]; posterior basitarsus of male usually as long as or longer than tibia (Halictidae, Nomiinae) 36

— Apex of marginal cell pointed [Fig. 105] or minutely truncate [Fig. 106]; posterior basitarsus of male shorter than tibia.....37

36(35, 121). Posterior marginal areas of terga not strongly colored, with hairs often forming apical hair bands ..... *Dieunomia* [48]

— Posterior marginal areas of terga bare, smooth, and hairless, forming green, blue, or yellow-green, enamel-like bands ..... *Nomia* [49]

37(35). Middle tibial spur coarsely serrate with 8 to 10 large teeth [Fig. 107] (Halictidae, Rophitinae, part) (rare, SW) ..... *Xeralictus* [56]

— Middle tibial spur finely pectinate or ciliate, appearing simple under low magnifications [Fig. 108] 38

101]; placa pigidial presente en la hembra y en muchos machos [Fig. 103], en la hembra muchas veces oculta bajo T5; segmentos del palpo labial, o al menos los tres últimos, similares, no largos y planos [como en Fig. 8] 35

35(34). Celda marginal con ápice redondeado [Fig. 104]; basitarso posterior del macho usualmente más largo o tan largo como la tibia (Halictidae, Nomiinae)..... 36

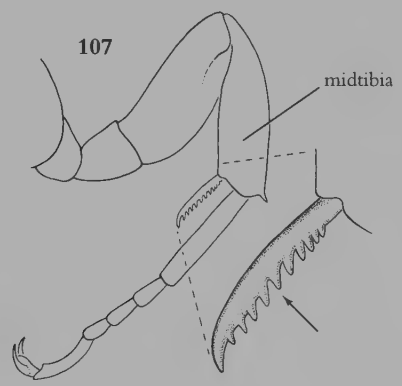
— Celda marginal con ápice en punta [Fig. 105] o muy brevemente trunco [Fig. 106]; basitarso posterior del macho más corto que la tibia..... 37

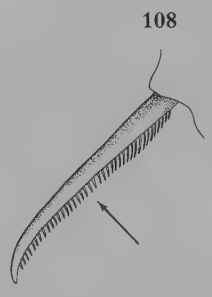
36(35, 121). Tergos con área marginal posterior no fuertemente coloreada, con pelos formando frecuentemente bandas apicales ..... *Dieunomia* [48]

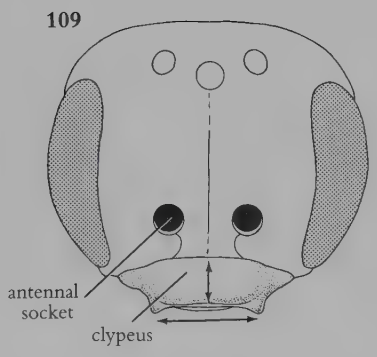
— Tergos con área marginal posterior glabra, lisa, y sin pelos, formando bandas apicales de apariencia esmaltada, de color verde, azul, o verde amarillento..... *Nomia* [49]

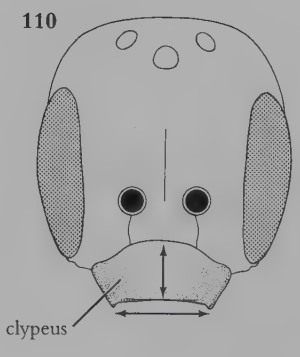
37(35). Espolones de las tibias medias fuertemente aserrados, con 8 a 10 grandes dientes [Fig. 107] (Halictidae, Rophitinae, parte) (raro, SW) ..... *Xeralictus* [56]

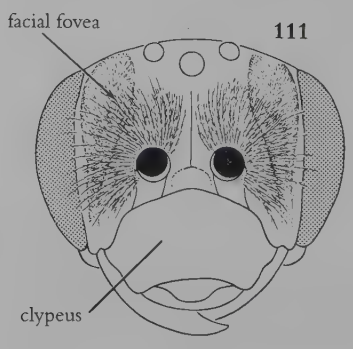
— Espolones de las tibias medias finamente pectinados o ciliados, vistos con bajos aumentos parecen simples [Fig. 108] 38











38(37). Antennal bases well below middle of face and usually separated from clypeus by little if any more than diameter of antennal socket [Figs. 109 and 110]; clypeus short, transverse, its upper margin not much arched upward [Figs. 109 and 110]; labrum nearly as long as clypeus (Halictidae, Rophitinae, part) 39

— Antennal bases near middle of face [Fig. 111]; if below, then either separated from clypeus by much more than diameter of antennal socket (as in some *Halictus*) or thorax coarsely punctate and basal area of propodeum coarsely striate or rugose (as in some *Sphecodes*); clypeus with upper margin strongly arched upward, so that it is not short and transverse [Fig. 111]; labrum (excluding apical process if present) much shorter than clypeus 41

39(38). Dorsal surface of propodeum about as long as metanotum [Fig. 112] (rare, California, Arizona) ..... *Protodufourea* [54]

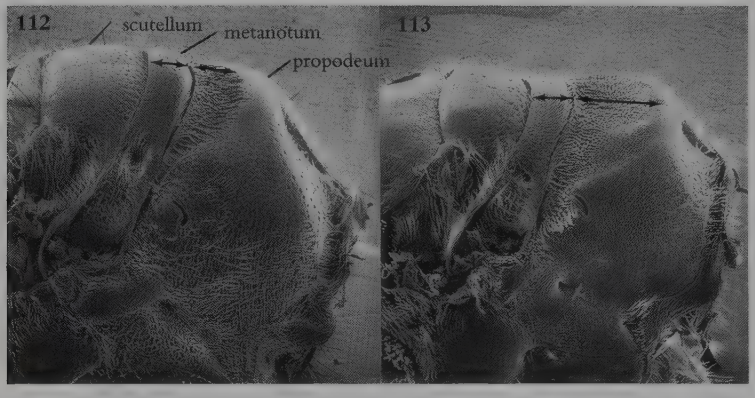
— Dorsal surface of propodeum longer than metanotum, about as long as scutellum [Fig. 113] (SW) 40

38(37). Antenas insertas muy por debajo de la mitad de la cara, usualmente separadas del clípeo, cuanto más, por una distancia poco mayor que el diámetro del alvéolo antenal [Figs. 109 y 110]; clípeo corto, transverso, margen superior no muy arqueado hacia arriba [Figs. 109 y 110]; labro casi tan largo como el clípeo (Halictidae, Rophitinae, parte) 39

— Antenas insertas cerca de la mitad de la cara [Fig. 111]; si por debajo, entonces separadas del clípeo por una distancia mucho más que el diámetro del alvéolo antenal (como en algunos *Halictus*) o el tórax fuertemente puntuado y el propodeo con el área basal fuertemente estriada o rugosa (como en algunos *Sphecodes*); clípeo con margen superior fuertemente arqueado hacia arriba, de modo que no es corto y transverso [Fig. 111]; labro (excluyendo el proceso apical si presente) mucho más corto que el clípeo 41

39(38). Superficie dorsal del propodeo aproximadamente tan larga como el metanoto [Fig. 112] (raro, California, Arizona) ..... *Protodufourea* [54]

— Superficie dorsal del propodeo más larga que el metanoto, aproximadamente tan larga como el escutelo [Fig. 113] (SW) 40

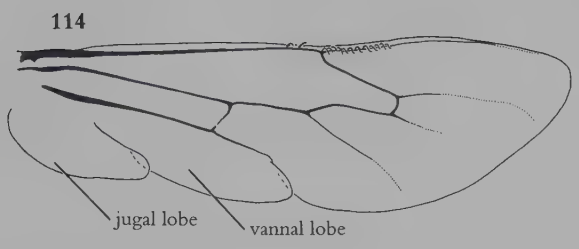


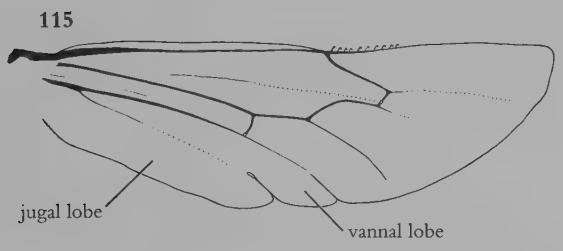
40(39). Body minutely roughened and more or less dull; apical, truncate margin of clypeus more than twice length of clypeus [Fig. 109] (uncommon) ..... *Conanthalictus* [50]

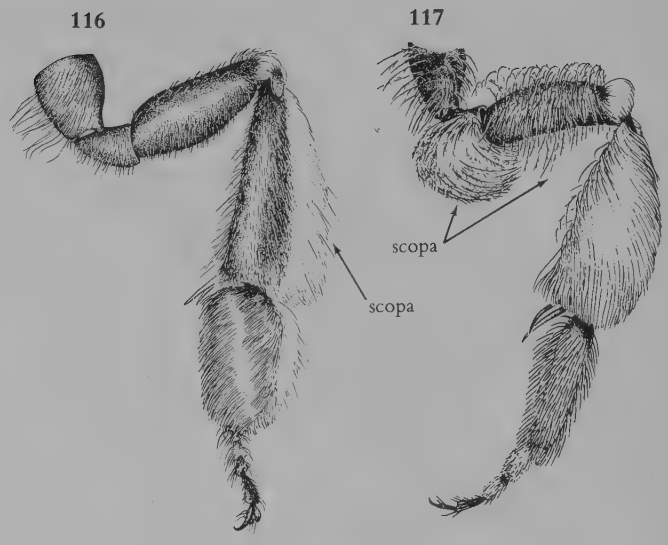
— Body largely shiny although with punctures, not minutely roughened; apical, truncate margin of clypeus less than or equal to twice length of clypeus [Fig. 110] (rare) ..... *Sphecodosoma* [55]

40(39). Cuerpo con rugosidad muy pequeña, más o menos opaco; clípeo más de dos veces tan ancho como largo [Fig. 109] (poco común) ..... *Conanthalictus* [50]

— Cuerpo mayormente brillante sin embargo puntuado, sin rugosidad pequeña; clípeo aproximadamente dos veces o menos tan ancho como largo [Fig. 110] (raro) ..... *Sphecodosoma* [55]







41(38). Jugal lobe of hind wing about half as long as vannal lobe measured from wing base [Fig. 114]; scopa of female on hind tibia, not on basal segments of leg [as in Fig. 116] (Melittidae, Melittinae, part) (rare) ..... *Melitta* [59]

— Jugal lobe of hind wing long, much more than half as long as vannal lobe [Fig. 115]; scopa of female (except in parasitic genera that lack the scopa) well developed on hind femur and sometimes trochanter [Fig. 117] 42

42(41). Basal vein (first abscissa of M) straight or feebly arcuate [Fig. 118]; facial foveae present in female and covered with short velvety hairs [Fig. 111] (Andrenidae, Andreninae, part) 43

— Basal vein strongly arcuate or subangulate near base [Fig. 119]; facial foveae absent (Halictidae, Halictinae, part) 48

43(42). Females 44

— Males 46

41(38). Lóbulo yugal del ala posterior aproximadamente la mitad del largo del lóbulo vanal medido desde la base del ala [Fig. 114]; hembra con escopa en la tibia posterior, pero no en los segmentos basales de la pata [como en Fig. 116] (Melittidae, Melittinae, parte) (raro) ..... *Melitta* [59]

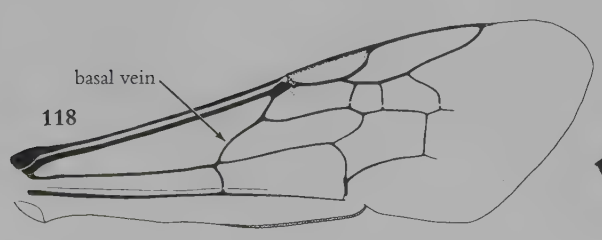
— Lóbulo yugal del ala posterior largo, mucho más de la mitad del largo del lóbulo vanal [Fig. 115]; hembra con escopa (excepto en los géneros parásitos que carecen de escopa) bien desarrollada en el fémur posterior y a veces también en el trocánter [Fig. 117] 42

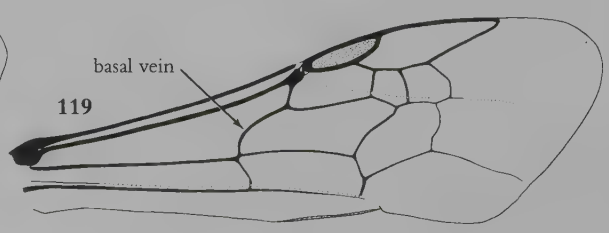
42(41). Vena basal (primera abscisa de M) recta o débilmente arqueada [Fig. 118]; hembra con fóveas faciales cubiertas por una corta pubescencia aterciopelada [Fig. 111] (Andrenidae, Andreninae, parte) 43

— Vena basal fuertemente arqueada o subangulosa cerca de la base [Fig. 119]; fóveas faciales ausentes (Halictidae, Halictinae, parte) 48

43(42). Hembras 44

— Machos 46



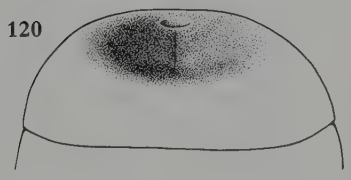


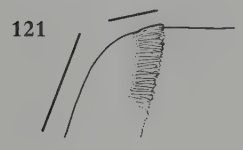
44(43). Hairs of hind trochanter rather dense, short, the longer ones simple, not much curved; anterior surface of T1 broadly concave [Fig. 120], much longer than dorsal surface of tergum [Fig. 121] (rare, SW) ..... *Ancylandrena* [9]

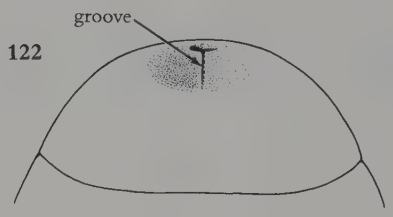
— Some hairs of hind trochanter long, curved distally, plumose, forming a floccus closing basal end of femoral corbicula [Fig. 117]; anterior surface of T1 with smaller concavity or groove [Fig. 122], shorter than to slightly longer than dorsal surface [Fig. 123]...45

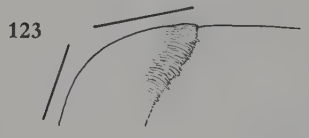
44(43). Pelos del trocánter posterior más bien densos, cortos, los más largos simples, no muy curvos; superficie anterior de T1 con concavidad amplia [Fig. 120], mucho más larga que la superficie dorsal [Fig. 121] (raro, SW) ..... *Ancylandrena* [9]

— Parte de los pelos del trocánter posterior largos, curvados distalmente, plumosos, formando un mechón que cierra el extremo basal de la corbícula femoral [Fig. 117]; superficie anterior de T1 con concavidad pequeña o con surco [Fig. 122], más corta o poco más larga que la superficie dorsal [Fig. 123] 45







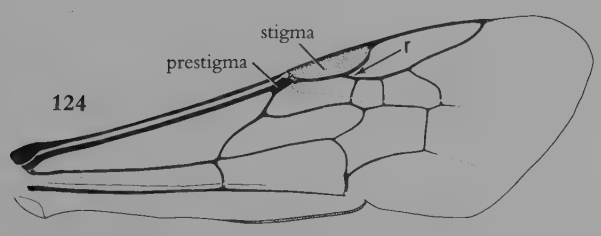


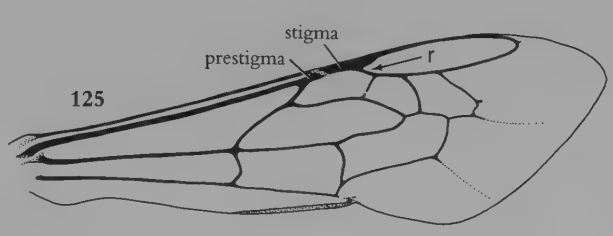
45(44). Hind basitarsus more than half as long as hind tibia [Fig. 117]; stigma often broader than prestigma (measured to wing margin), margins of stigma diverging from base of stigma to vein r [Fig. 124]; length of stigma usually more than half distance from its apex to apex of marginal cell ..... *Andrena* (part) [10]

— Hind basitarsus about half as long as hind tibia; stigma about as wide as prestigma (measured to wing margin), margins parallel or nearly so from base of stigma to vein r [Fig. 125]; length of stigma

45(44). Basitarso posterior más de la mitad del largo de la tibia posterior [Fig. 117]; estigma frecuentemente más ancho que el prestigma (medido hasta el margen alar), con márgenes divergiendo de la base del estigma hacia la vena r [Fig. 124]; largo del estigma usualmente más de la mitad de la distancia entre su ápice y el ápice de la celda marginal ..... *Andrena* (parte) [10]

— Basitarso posterior aproximadamente la mitad del largo de la tibia; estigma casi tan ancho como el prestigma (medido hasta el margen alar), con márgenes más o menos paralelos desde la base hasta la vena r [Fig. 125]; largo del estigma





less than half distance from its apex to apex of marginal cell [Fig. 125] (rare, SW) ..... *Megandrena* [11]

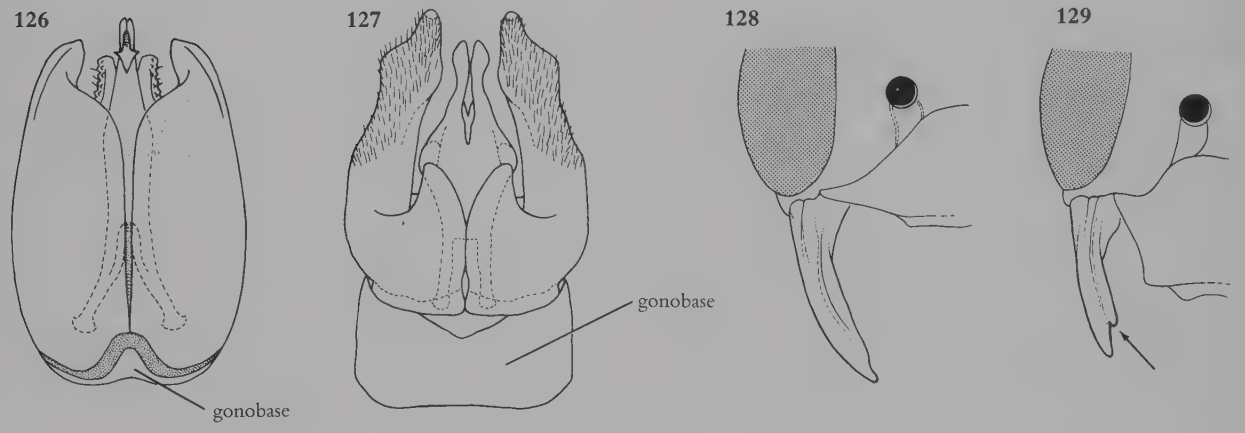
46(43). Gonobase a narrow ring or essentially absent [Fig. 126]; mandible simple or with weak preapical shoulder representing apex of pollex on upper margin [Fig. 128] (rare, SW) ..... *Megandrena* [11]

— Gonobase with broad dorsal surface [Fig. 127]; mandible with preapical tooth (apex of pollex) on upper margin [Fig. 129] 47

menos de la mitad de la distancia entre su ápice y el ápice de la celda marginal [Fig. 125] (raro, SW) ..... *Megandrena* [11]

46(43). Gonobase formando un angosto anillo o prácticamente ausente [Fig. 126]; mandíbula simple o con un ángulo romo preapical débil en el margen superior que representa el ápice del póllex [Fig. 128] (raro, SW) ..... *Megandrena* [11]

— Gonobase dorsalmente ancha [Fig. 127]; mandíbula con un diente preapical (ápice del póllex) en el margen superior [Fig. 129] 47



47(46). Anterior surface of T1 largely convex, concavity a median longitudinal groove or depression shorter than to slightly longer than distance from its apex to apex of T1 [as in Figs. 122 and 123]; hind basitarsus five or more times as long as wide ..... *Andrena* (part) [10]

— Anterior surface of T1 concave with median longitudinal line or groove, this surface usually longer than distance from its apex to apex of T1 [Figs. 120 and 121]; hind basitarsus less than five times as long as wide (rare, SW) ..... *Ancylandrena* [9]

48(42). Females 49

— Males 54

49(48). Scopa absent or rudimentary; T5 without hairy zone (prepygidial fimbria) divided by longitudinal

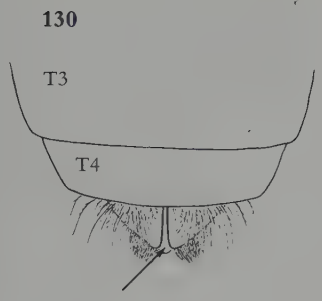
47(46). Superficie anterior de T1 mayormente convexa, con surco longitudinal medio o con depresión más corta o poco más larga que la distancia de su ápice al ápice de T1 [como en Figs. 122 y 123]; basitarso posterior cinco o más veces tan largo como ancho ..... *Andrena* (parte) [10]

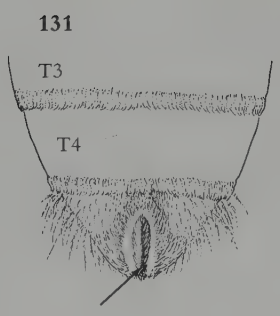
— Superficie anterior de T1 cóncava, con surco o línea longitudinal, superficie cóncava usualmente más larga que la distancia de su ápice al ápice de T1 [Figs. 120 y 121]; basitarso posterior menos de cinco veces tan largo como ancho (raro, SW) ..... *Ancylandrena* [9]

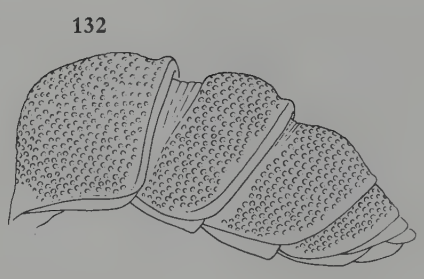
48(42). Hembras 49

— Machos 54

49(48). Escopa ausente o rudimentaria; T5 sin área pilosa (fimbria prepigidial) dividida al medio por una hendidura o







median cleft or area of short, dense hairs or fine punctation 50

— Scopa present, well developed on femur (reduced to series of simple hairs in subgenus *Sphecodogastra* of *Lasioglossum*); T5 with strong prepygidial fimbria divided by longitudinal median cleft or area of short, dense hairs or fine, dense punctation [Figs. 130 and 131] (this area merely an apical triangle in *Megalopta* and especially *Megommation;* see Appendix C) 54

50(49). Brilliant metallic green; coarsely punctured [Fig. 132] (Augochlorini, part) (rare, tropical to Arizona) ..... *Temnosoma* [33]

— Dull greenish or nonmetallic, punctation variable (Halictini, part) (see Appendix C; genus near *Megommation,* Augochlorini) 51

51(50). Dull greenish; distal veins of forewing (second and third transverse cubitals and second recurrent) weaker than other veins [as in Fig. 133] (rare) .... *Paralictus* [44]

— Nonmetallic; distal veins of forewing strong [Fig. 134] 52

área longitudinal de pelos cortos y densos o puntuación fina 50

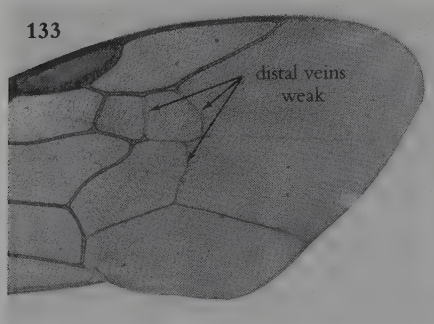
— Escopa presente, bien desarrollada en el fémur (reducida a series de pelos simples en el subgénero *Sphecodogastra* de *Lasioglossum*); T5 con fimbria prepigidial fuerte dividida por una franja o area longitudinal de pelos cortos y densos o puntuación fina y densa [Figs. 130 y 131] (esta área apenas un triángulo apical en *Megalopta* y especialmente en *Megommation;* ver "Appendix C") 54

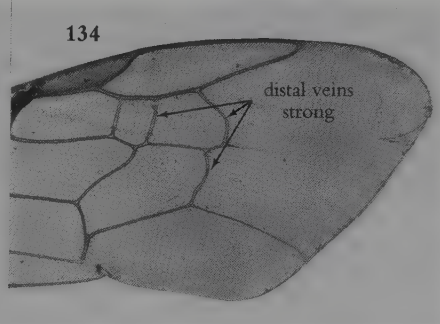
50(49). Verde metálico brillante; con puntuación fuerte [Fig. 132] (Augochlorini, parte) (raro, tropical hasta Arizona) .. .. *Temnosoma* [33]

— Verdoso opaco o no metálico; puntuación variable (Halictini, parte) (ver "Appendix C"; género cerca de *Megommation,* Augochlorini) 51

51(50). Verdoso opaco; venas distales del ala anterior (segunda y tercera transversa cubitales y segunda recurrente) más débiles que las otras venas [Fig. 133] (raro) .... *Paralictus* [44]

— No metálico; venas distales del ala anterior fuertes [Fig. 134] 52





52(51, 57). Inner orbits of eyes strongly converging below [Fig. 135]; head little wider than long [Fig. 135]; clypeus about twice as broad as long (rare, tropical)* ..... *Ptilocleptis* [45]

— Inner orbits usually not strongly converging [Fig. 136]; head distinctly wider than long seen from front [Fig. 136]; clypeus usually three or more times as wide as long* 53

53(52). Free part of marginal cell about or more than three times as long as part subtended by submarginal cells [Fig. 137]; T1 slightly longer than broad; T5 of female with apical margin bare, like preceding terga (rare, tropical) ..... *Microsphecodes* [42]

— Free part of marginal cell less than twice as long as part subtended by submarginal cells [Fig. 138]; T1 usually broader than long; T5 of female with margin more hairy than that of preceding terga .... *Sphecodes* (part) [47]

52(51, 57). Orbitas internas de los ojos convergiendo fuertemente abajo [Fig. 135]; cabeza poco más ancha que larga [Fig. 135]; clípeo aproximadamente tan ancho como largo (raro, tropical)* ..... *Ptilocleptis* [45]

— Orbitas internas usualmente no fuertemente convergentes [Fig. 136]; cabeza en vista frontal claramente más ancha que larga [Fig. 136]; clípeo usualmente tres o más veces mas ancho que largo* 53

53(52). Parte libre de la celda marginal aproximamente o más de tres veces del largo de la parte subtendida por las celdas submarginales [Fig. 137]; T1 poco más largo que ancho; margen apical de T5 en la hembra glabro, como en los tergos anteriores (raro, tropical) ..... *Microsphecodes* [42]

— Parte libre de la celda marginal menos de dos veces del largo de la parte subtendida por las celdas submarginales [Fig. 138]; T1 usualmente más ancho que largo; margen apical de T5 en la hembra más piloso que en los tergos anteriores ..... *Sphecodes* (parte) [47]

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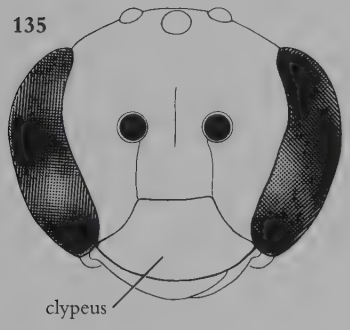

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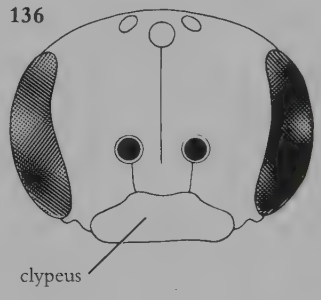

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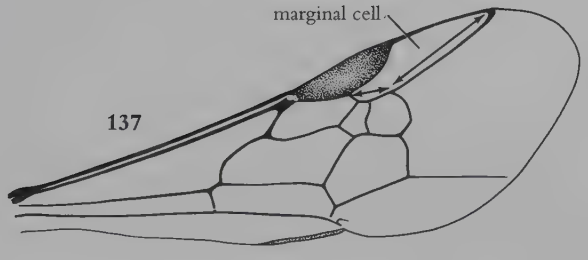

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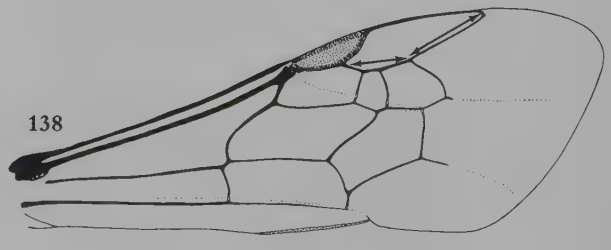
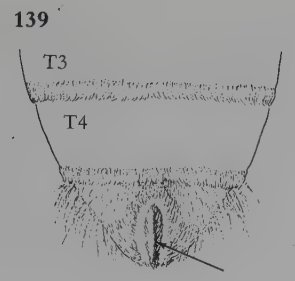
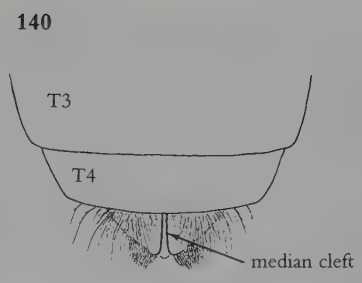
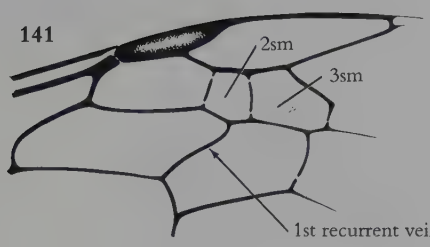


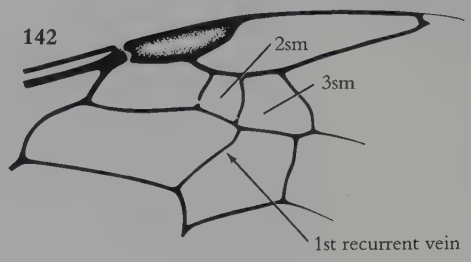
*Additional species show that the distinctions indicated in couplet 52 separating *Ptilocleptis* from *Sphecodes* break down. Possibly better characters for *Ptilocleptis* are a continuous carina between the lateral angles of the pronotum and a constriction between S1 and S2, the surface of S2 being conspicuously convex seen in profile. *Sphecodes* lacks these features.

*El estudio de más especies de muestra que las diferencias indicadas en la opción 52 para separar *Ptilocleptis* de *Sphecodes* no funcionan. Posiblemente, la carina continua entre los ángulos laterales del pronoto, la constricción entre S1 y S2, y la superficie de S2 conspicuamente convexa en vista lateral son mejores caracteres para separar *Ptilocleptis*, ya que en *Sphecodes* están ausentes.









54(48, 49). Median specialized area of T5 of female not divided by a cleft [Fig. 139]; T7 of male with pygidial plate or at least carina representing its posterior margin, behind which tergum is abruptly reflexed; first recurrent vein meeting second submarginal cell or meeting second transverse cubital [Fig. 141]; second hind tarsomere of male often fused to first or joined by articulation broader than that between subsequent segments [Fig. 167] (Halictini, part)..55

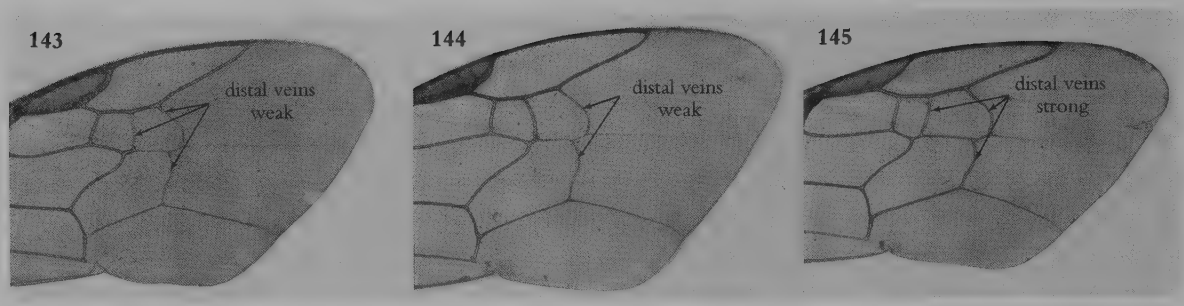
— Median specialized area of T5 of female divided by a deep cleft (often difficult to see among hairs) [Fig. 140]; T7 of male without pygidial plate, apical part not reflexed; first recurrent vein near second transverse cubital or meeting third submarginal cell [Fig. 142]; first and second hind tarsal segments of male articulated like second and third (Augochlorini, part) 75

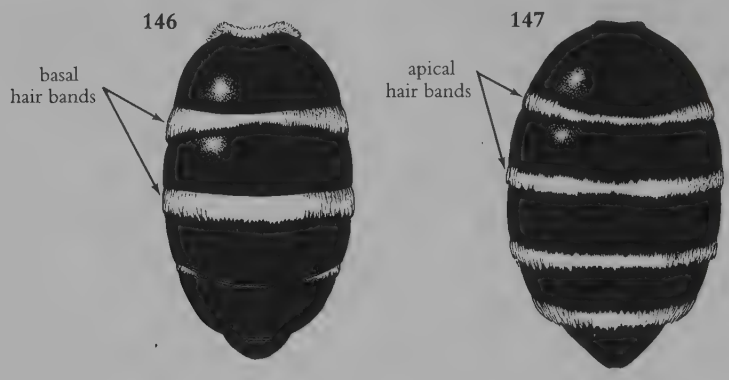
55(54). Distal veins of forewing (third and often second transverse cubital and second recurrent) weaker than other veins (e.g., first transverse cubital) [Figs. 143 and 144] (this character is weak in some males, which therefore go to 56); not brilliantly metallic except in a few, mostly Antillean species; metasomal terga without apical hair bands, basal hair bands present [Fig. 146] or absent (Subgroups sometimes

54(48, 49). T5 de la hembra con área media especializada no hendida [Fig. 139]; T7 del macho con placa pigidial o al menos con carena representando su margen posterior, tras la cual el tergo se repliega abruptamente; primera vena recurrente uniéndose a la segunda celda submarginal o a la vena segunda transversa cubital [Fig. 141]; segundo tarsómero posterior del macho frecuentemente fusionado al primero o unido por una articulación más ancha que la de los siguientes segmentos [Fig. 167] (Halictini, parte)... 55

— T5 de la hembra con área media especializada con una profunda hendidura frecuentemente difícil de ver entre los pelos [Fig. 140]; T7 del macho sin placa pigidial, y sin parte apical replegada; primera vena recurrente cerca de la segunda transversa cubital o uniéndose a la tercera celda submarginal [Fig. 142]; articulación entre primer y segundo tarsómero del macho similar a la de segundo y tercero (Augochlorini, parte) 75

55(54). Venas distales del ala anterior (tercera transversa cubital, frecuentemente segunda transversa cubital, y segunda recurrente) más débiles que las otras venas (por ejemplo, que la primera transversa cubital) [Figs. 143 y 144] (este carácter no es claro en algunos machos, que van entonces a 56); sin metálico brillante, excepto en unas pocas especies, la mayoría de las Antillas; tergos del metasoma sin bandas apicales de pelos, bandas basales de pelos presentes





recognized as genera are characterized in "Notes.") ..... *Lasioglossum* (part) [40]

— Distal veins of forewing strong [Fig. 145]; coloration and hair bands variable 56

56(55). T1–T4 with apical bands of pale hairs [Fig. 147]; body not or weakly metallic ..... *Halictus* [39]

— T1–T4 without bands or with basal bands of hairs [Fig. 146]; coloration variable 57

57(56). Propodeum coarsely areolate, basal area usually with striae separating large pits [Fig. 148]; rest of thorax commonly coarsely punctate [Fig. 151]; body not metallic (males of *Sphecodes* group) ..... back to 52

— Propodeum variable but not coarsely areolate [Figs. 149 and 150]; sculpturing in general weaker [Fig. 152]; body frequently weakly or strongly metallic 58

58(57). Eyes glabrous or with minute hairs much less than half as long as diameter of median ocellus 59

— Eyes pilose [as in Fig. 321], with erect hairs at least half as long as diameter of median ocellus 65

[Fig. 146] o ausentes (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") .... *Lasioglossum* (parte) [40]

— Venas distales del ala anterior fuertes [Fig. 145]; coloración y bandas de pelos variable 56

56(55). T1–T4 con bandas apicales de pelos claros [Fig. 147]; no metálico o sólo débilmente ..... *Halictus* [39]

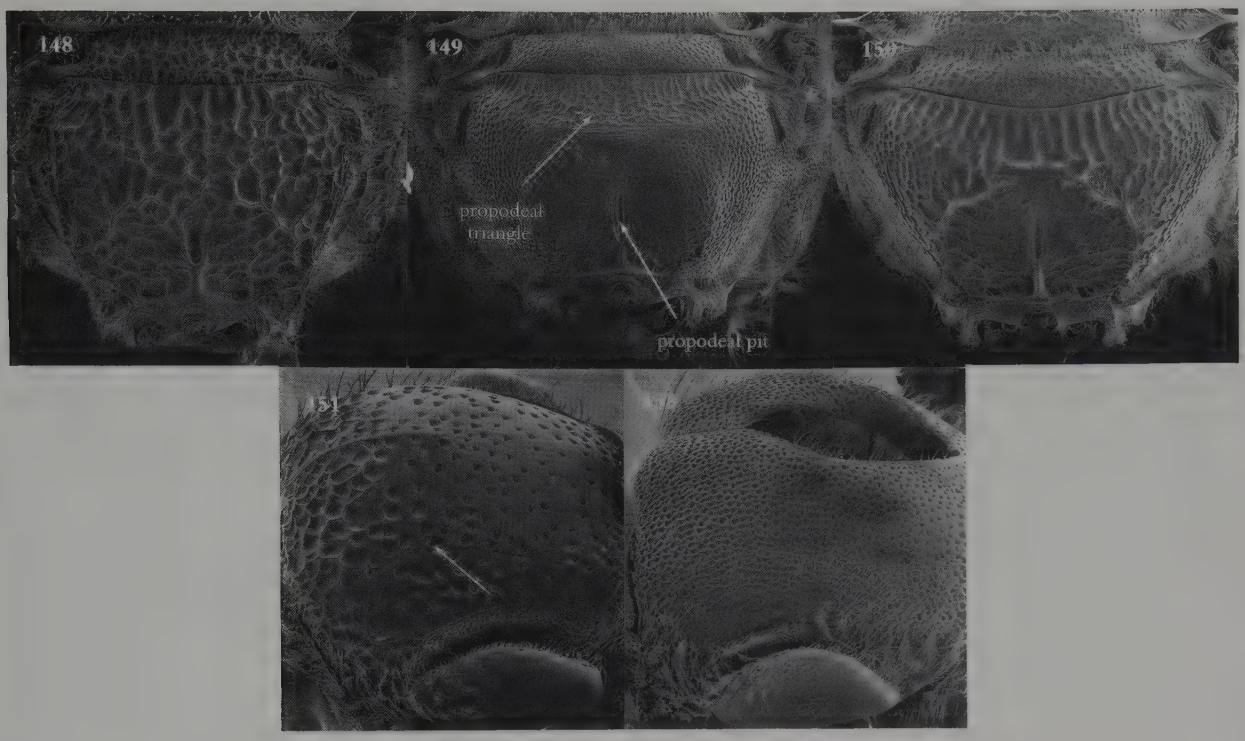
— T1–T4 sin bandas o con bandas basales de pelos [Fig. 146]; coloración variable 57

57(56). Propodeo fuertemente areolado, área basal usualmente con estrías separando grandes hoyuelos [Fig. 148]; resto del tórax por lo común fuertemente puntuado [Fig. 151]; cuerpo no metálico (machos del grupo *Sphecodes*) .... volver a 52

— Propodeo variable, pero no fuertemente areolado [Fig. 149 y 150]; escultura en general más débil [Fig. 152]; frecuentemente cuerpo débilmente a fuertemente metálico 58

58(57). Ojos glabros o con pelos diminutos, cuyo largo es mucho menor que el diámetro del ocelo medio 59

— Ojos pilosos [como en Fig. 321], con pelos erectos al menos tan largos como la mitad del diámetro del ocelo medio 65



59(58). Females 60
— Males 61

60(59). Inner hind tibial spur serrate [Fig. 153]; body weakly metallic (like *Lasioglossum* subgenus *Dialictus* or *Halictus* subgenus *Seladonia*) without yellow markings (rare, Mexico to Arizona) ..... *Mexalictus* [41]
— Inner hind tibial spur pectinate with a few large teeth [Fig. 154]; body usually at least partly bright green or blue* 74

59(58). Hembras 60
— Machos 61

60(59). Espolón interno de la tibia posterior aserrado [Fig. 153]; cuerpo metálico débil (como *Lasioglossum* subgénero *Dialictus* o *Halictus* subgénero *Seladonia*) sin manchas amarillas (raro, México hasta Arizona) ..... *Mexalictus* [41]
— Espolón interno de la tibia posterior pectinado, con unos pocos dientes grandes [Fig. 154]; usualmente cuerpo, al menos en parte, verde o azul brillante* 74

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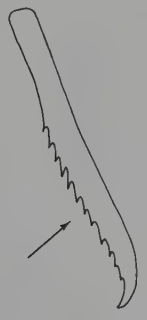

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*Couplets 60 and 61 both have an alternative leading to 74; this is not an error.

*Las alternativas 60 y 61 llevan ambas a 74; esto no es un error.

61(59). Body nonmetallic or weakly metallic greenish or bluish (bright in rare Antillean group); yellow areas absent or limited to clypeus and legs, usually not leg bases, and yellow usually dull, not bright.....62

— Body at least partly bright green or blue; with bright yellow or cream areas on clypeus, legs (including bases), and usually elsewhere* 74

62(61). Black, not at all greenish or bluish (Subgroups sometimes recognized as genera are characterized in "Notes.") ..... *Lasioglossum* (part) [40]

— Body weakly (rarely strongly) greenish or bluish 63

63(62). Second flagellar segment shorter than or as long as first [Fig. 155]; S7 with two apodemes on each side, without apical projection (rare, Mexico to Arizona)..... *Mexalictus* [41]

— Second flagellar segment longer than first [Fig. 156]; S7 with one apodeme on each side, with median apical projection.....64

64(63). Distance between antennal sockets more than two socket diameters [Fig. 157]; S7 with median apical projection or sternum parallel-sided at base and less than twice as long as broad (rare)..... ..... *Paralictus* [44]

— Distance between antennal sockets two socket diameters or less [Fig. 158]; S7 not parallel-sided or, if parallel-sided, then more than twice as long as broad (Subgroups sometimes recognized as genera are characterized in "Notes.") ... *Lasioglossum* (part) [40]

61(59). Cuerpo no metálico o debilmente metálico verdoso o azulino (brillante en un raro grupo antillano); áreas amarillas ausentes o limitadas al clípeo y las patas, usualmente no en la base de las patas, y amarillo usualmente opaco, no brillante 62

— Cuerpo al menos en parte verde o azul brillante; con áreas color crema o amarillo brillante en el clípeo, patas (bases incluídas), y usualmente otras partes* 74

62(61). Color negro, nunca verdoso o azulino (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") ..... *Lasioglossum* (parte) [40]

— Cuerpo débilmente (raramente fuertemente) verdoso o azulino..... 63

63(62). Segundo flagelómero más corto o tan largo como el primero [Fig. 155]; S7 con dos apodemas a cada lado, sin proyección apical (raro, México hasta Arizona) ....*Mexalictus* (parte) [41]

— Segundo flagelómero más largo que el primero [Fig. 156]; S7 con un apodema a cada lado, y con proyección media apical 64

64(63). Distancia entre alvéolos antenales más del doble del diámetro alveolar [Fig. 157]; S7 con proyección media apical o esterno basalmente con lados paralelos y menos de dos veces tan largo como ancho (raro)..... *Paralictus* [44]

— Distancia entre alvéolos antenales igual o menos del doble del diámetro alveolar [Fig. 158]; S7 con lados no paralelos o, si paralelos, más de dos veces más largo que ancho (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.")..... *Lasioglossum* (parte) [40]

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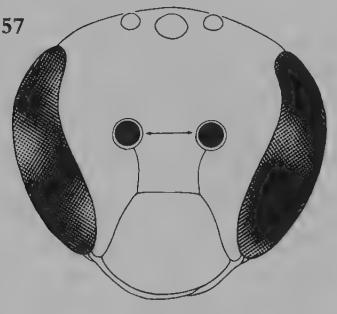

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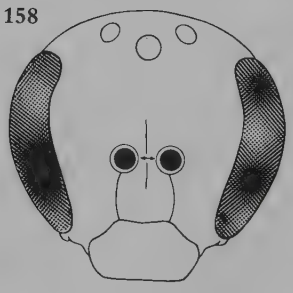
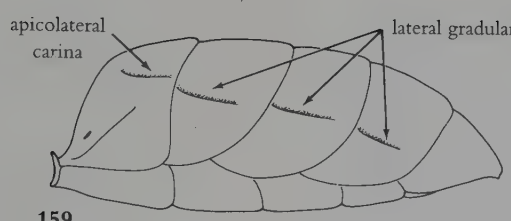


*Couplets 60 and 61 both have an alternative leading to 74; this is not an error.

*Las alternativas 60 y 61 llevan ambas a 74; esto no es un error.



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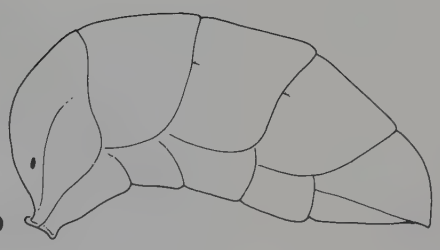
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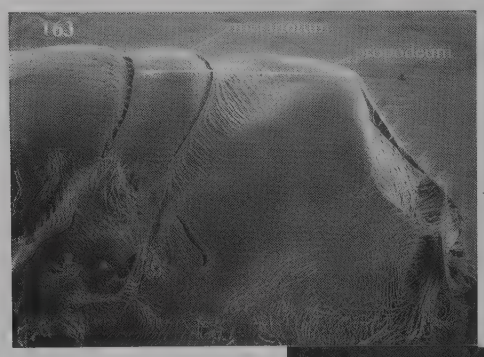
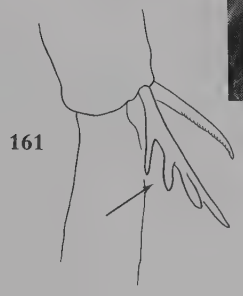
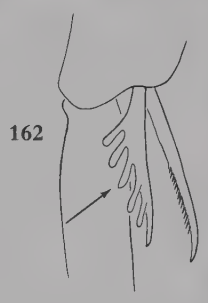
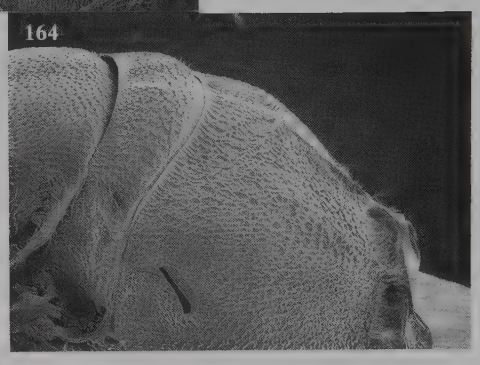
65(58). Females 66
— Males 70
66(65). T1 with apicolateral carina [Fig. 159]; T2–T4 with lateral gradular carinae [Fig. 159]; metasoma lacking metallic coloration (rare, tropical) ..... *Rhinetula* [46]
— T1 without apicolateral carina [Fig. 160]; T2–T4 without lateral gradular carinae [Fig. 160] or, if carinae present, then metasoma brilliant metallic blue to green 67
67(66). Hairs on eye subequal to ocellar radius; T2–T4 lacking metallic coloration and with distinct basal yellow bands (sometimes hidden by preceding terga) (rare, tropical) ..... *Agapostemonoides* [35]
— Hairs on eye subequal to ocellar diameter; metasomal terga usually with metallic coloration basally and lacking yellow bands 68
68(67). Inner hind tibial spur with 3 or 4 teeth [Fig. 161]; propodeum with dorsal surface about twice as long as metanotum in dorsal view [Fig. 163] (rare, tropical) ..... *Caenohalictus* [36]
— Inner hind tibial spur with 5–11 teeth [as in Fig. 162]; propodeum with dorsal surface less than 1.5 times length of metanotum in dorsal view [Fig. 164] (rare, mostly Mesoamerican) 69
69(68). Metasomal terga brilliant metallic blue or green; T2–T4 with distinct lateral gradular carinae [Fig. 165] ..... *Paragapostemon* [43]
— Metasomal terga with metallic tints absent or reduced to inconspicuous basal bands; terga without lateral gradular carinae [Fig. 160] ..... *Dinagapostemon* [37]
70(65). T2–T4 with lateral gradular carinae [Fig. 165] 71
— Metasomal terga without lateral gradular carinae [Fig. 160] 72

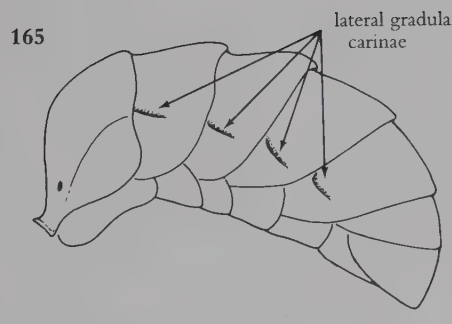
65(58). Hembras 66
— Machos 70
66(65). T1 con carena apicolateral [Fig. 159]; T2–T4 con carenas gradulares laterales [Fig. 159]; metasoma sin coloración metálica (raro, tropical) ..... *Rhinetula* [46]
— T1 sin carena apicolateral [Fig. 160]; T2–T4 sin carenas gradulares laterales [Fig. 160] o, si carenas presentes, entonces metasoma azul o verde metálico brillante 67
67(66). Ojos con pelos subiguales al radio ocelar; T2–T4 sin coloración metálica y con bandas basales amarillas conspicuas (a veces ocultas por los tergos precedentes) (raro, tropical) ..... *Agapostemonoides* [35]
— Ojos con pelos subiguales al diámetro ocelar; tergos del metasoma basalmente usualmente con coloración metálica y sin bandas amarillas 68
68(67). Espolón tibial posterior interno con 3 o 4 dientes [Fig. 161]; propodeo con superficie dorsal aproximadamente dos veces más larga que el metanoto cuando visto dorsal [Fig. 163] (raro, tropical) ..... *Caenohalictus* [36]
— Espolón tibial posterior interno con 5–11 dientes [como en Fig. 162]; propodeo con superficie dorsal menos de 1,5 veces el largo del metanoto en vista dorsal [Fig. 164] (raros, mayormente de Mesoamérica) 69
69(68). Tergos del metasoma azul o verde metálico brillante; carenas gradulares de T2–T4 lateralmente conspicuas [Fig. 165] ..... *Paragapostemon* [43]
— Tergos del metasoma con tinte metálico ausente o reducido a bandas basales inconspicuas; tergos sin carenas gradulares laterales [Fig. 160] ..... *Dinagapostemon* [37]
70(65). T2–T4 con carenas gradulares laterales [Fig. 165] 71
— Tergos del metasoma sin carenas gradulares laterales [Fig. 160] 72

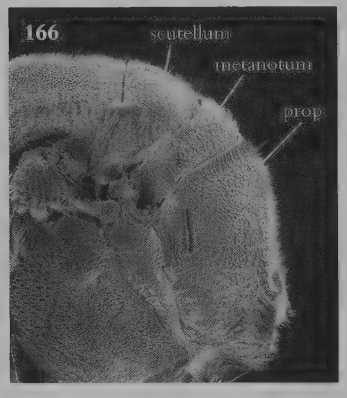


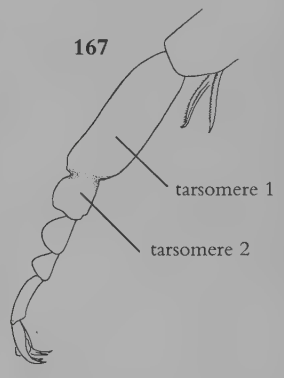












71(70). Metasoma brilliant metallic green or blue dorsally; propodeum in side view angulate with distinct dorsal and posterior surfaces [Fig. 164] (rare, Mexico) ..... *Paragapostemon* [43]

— Metasoma without metallic coloration; propodeum in side view declivous, without distinct dorsal surface [Fig. 166] (rare, tropical) .....*Rhinetula* [46]

72(70). Hind tarsomeres 1 and 2 fused [Fig. 167]; propodeum less than 1.5 times as long as metanotum viewed from above [as in Fig. 164]; clypeus yellow on lower three-fourths 73

— Hind tarsomeres 1 and 2 articulated, free; propodeum nearly twice as long as metanotum viewed

71(70). Metasoma dorsalmente verde o azul metálico brillante; propodeo en vista lateral anguloso, con superficies dorsal y posterior bien delimitadas [Fig. 164] (raro, México) .... *Paragapostemon* [43]

— Metasoma sin coloración metálica; propodeo en vista lateral en declive, sin superficie dorsal bien delimitada [Fig. 166] (raro, tropical)..... *Rhinetula* [46]

72(70). Tarsómeros posteriores 1 y 2 fusionados [Fig. 167]; propodeo menos de 1,5 veces más largo que el metanoto en vista dorsal [como en Fig. 164]; clípeo amarillo en los tres cuartos inferiores..... 73

— Tarsómeros posteriores 1 y 2 articulados, libres; propodeo casi dos veces más largo que el metanoto en vista dorsal

from above [Fig. 163]; clypeus with yellow restricted to lower margin (rare, tropical)..... ..... *Caenohalictus* [36]

73(72). T2, T3, and/or T4 with basal or basilateral yellow maculae; hind femur not swollen and lacking ventral tooth (rare, tropical)..... *Agapostemonoides* [35]

— Metasomal terga without yellow maculae; hind femur swollen and with ventral tooth [Fig. 168] (rare, Mesoamerica to Andes)..... *Dinagapostemon* [37]

74(60, 61). Posterior surface of propodeum enclosed by distinct carina [Fig. 169]; metasomal terga of female metallic green or blue or black to amber, of male black to amber with conspicuous yellow bands (if bands absent, then hind femur swollen); metasoma not slender and petiolate [Fig. 169] .... *Agapostemon* [34]

— Posterior surface of propodeum without distinct marginal carina [as in Fig. 170]; metasoma nonmetallic black to brown, commonly with distinct yellow maculae or bands in female, usually with little or no yellow in male; metasoma of male slender, petiolate [as in Fig. 170] (rare, tropical) .... *Habralictus* [38]

75(54). Ocelli much enlarged [Fig. 171]; mandible of female with two large teeth or tubercles on inner surface in addition to the usual bidentate apex [Fig. 171] (tropical) ..... *Megalopta* [28]

— Ocelli of the usual size [Fig. 185]; mandible without teeth on inner surface.....76

[Fig. 163]; clípeo con amarillo restringido al margen inferior (raro, tropical) ..... *Caenohalictus* [36]

73(72). T2, T3, y/o T4 con manchas amarillas basales o laterobasales; fémur posterior no hinchado y sin diente ventral (raro, tropical).....*Agapostemonoides* [35]

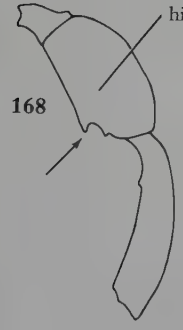
— Tergos del metasoma sin manchas amarillas; fémur posterior hinchado y con diente ventral [Fig. 168] (raro, Mesoamérica a Andes) ..... *Dinagapostemon* [37]

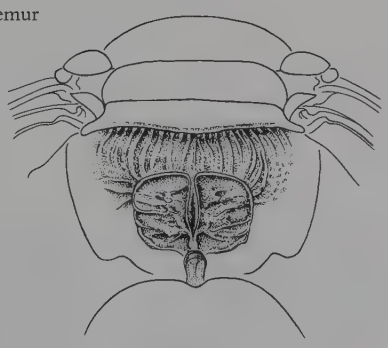
74(60, 61). Superficie posterior del propodeo encerrada por una conspicua carena [Fig. 169]; hembra con tergos del metasoma verde o azul metálicos, o negros a ámbar, en el macho negros a ámbar y con conspicuas bandas amarillas (si bandas ausentes, entonces fémures posteriores hinchados); metasoma ni angosto ni peciolado [Fig. 169]..... ..... *Agapostemon* [34]

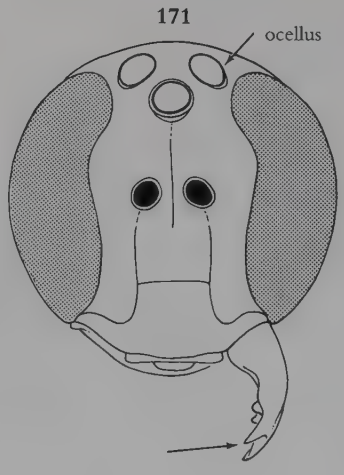
— Superficie posterior del propodeo sin carena marginal conspícua [como en Fig. 170]; metasoma negro opaco a castaño, comúnmente con bandas o manchas amarillas conspícuas en la hembra, usualmente sin o con poco amarillo en el macho; metasoma del macho angosto, peciolado [como en Fig. 170] (raro, tropical)..... ..... *Habralictus* [38]

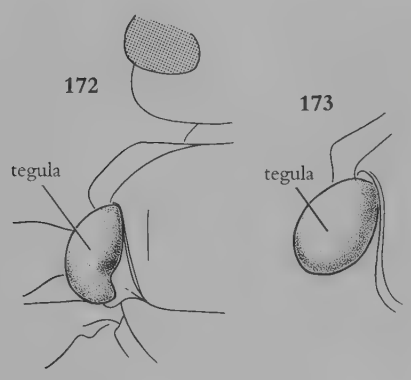
75(54). Ocelos muy grandes [Fig. 171]; mandíbula de la hembra con dos grandes dientes o tubérculos en la superficie interna, a más del ápice bidentado usual [Fig. 171] (tropical) .....*Megalopta* [28]

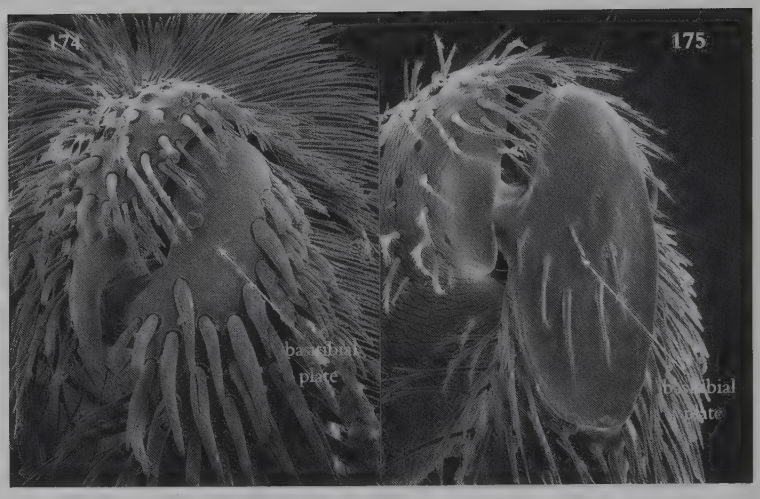
— Ocelos de tamaño usual [Fig. 185]; mandíbula sin dientes en la superficie interna 76











76(75). Tegula with inner posterior angle slightly produced (although rounded) [Fig. 172]; basitibial plate of female very short, scarcely extending past apex of femur [Fig. 174]; T1 and T2 usually each with an apical marginal series of simple bristles .... *Augochloropsis* [25]

— Tegula with inner posterior angle gently rounded [Fig. 173]; basitibial plate of female extending well beyond apex of femur [Fig. 175]; terga with apical margins bare, without series of bristles or hairs ... 77

77(76). Body very coarsely punctate [Fig. 176]; T2–T3 strongly depressed (constricted in lateral view) basally (male) [Fig. 176] (rare, tropical to Arizona) .... *Temnosoma* [33]

— Body not unusually coarsely punctate; T2–T3 not strongly depressed basally 78

78(77). Females 79

— Males 85

76(75). Tégula con ángulo interno posterior un poco proyectado (aunque redondeado) [Fig. 172]; placa basitibial de la hembra muy corta, apenas extendiéndose más allá del ápice del fémur [Fig. 174]; T1 y T2 usualmente con una serie apical de setas marginales simples .... *Augochloropsis* [25]

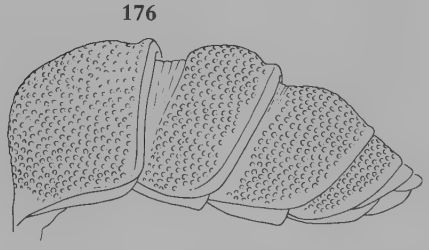
— Tégula con ángulo interno posterior suavemente redondeado [Fig. 173]; placa basitibial de la hembra extendiéndose mucho más allá del ápice femoral [Fig. 175]; tergos con ápices marginales sin series de setas o pelos 77

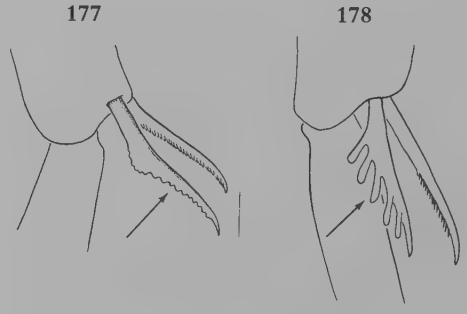
77(76). Cuerpo muy fuertemente puntuado [Fig. 176]; T2–T3 fuertemente deprimidos en la base (constrictos en vista lateral) (macho) [Fig. 176] (raro, tropical hasta Arizona) .. .. *Temnosoma* [33]

— Cuerpo usualmente no fuertemente puntuado; T2–T3 no fuertemente deprimidos en la base 78

78(77). Hembras 79

— Machos 85





79(78). Inner hind tibial spur serrate, teeth wider than long (pointed or rounded) [Fig. 177] 80

— Inner hind tibial spur pectinate, teeth longer than wide [Fig. 178] 82

80(79). Paraocular lobe extending down as acute (although rounded) angle into clypeus [Fig. 179]; clypeus gently convex, green almost to apex; marginal cell distinctly although narrowly truncate at apex [Fig. 181] ..... *Augochlora* [23]

— Paraocular lobe extending down into clypeus obtuse or right angular [Fig. 180]; clypeus with nonmetallic lower part (about half) at a distinct angle to upper green part; marginal cell with apex pointed on wing margin or nearly so [as in Fig. 119] 81

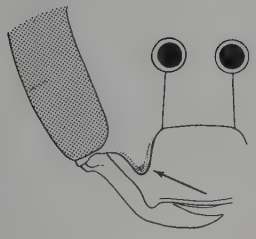
79(78). Espolón tibial posterior interno aserrado, dientes más anchos que largos (aguzados o redondeados) [Fig. 177] 80

— Espolón tibial posterior interno pectinado, dientes más largos que anchos [Fig. 178] 82

80(79). Lóbulo paraocular extendiéndose hacia abajo en el clípeo en ángulo agudo (aunque redondeado) [Fig. 179]; clípeo suavemente convexo, verde casi hasta el ápice; celda marginal con ápice brevemente trunco pero conspicuo [Fig. 181] ..... *Augochlora* [23]

— Lóbulo paraocular extendiéndose hacia abajo en el clípeo en ángulo obtuso o recto [Fig. 180]; clípeo con parte inferior no metálica (aproximadamente la mitad) en ángulo con la parte superior verde; celda marginal con ápice más o menos en punta sobre el margen alar [como en Fig. 119] 81

179



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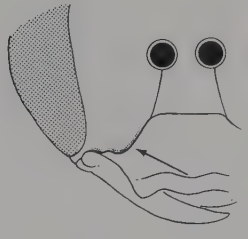
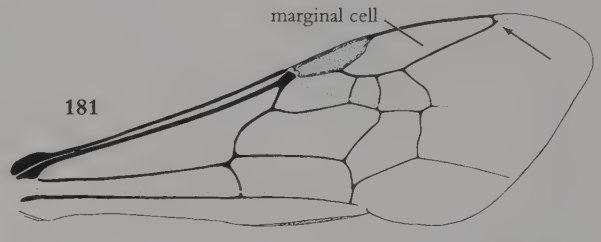




181

81(80). Inner hind tibial spur with few, short, rounded teeth, basal one largest [Fig. 182]; basal area of propodeum strongly granular, striate basally; body length about 5 mm (tropical) ..... *Pereirapis* [31]

— Inner hind tibial spur with rounded, fine serrations [Fig. 183], spur broadened near base; basal area of propodeum not strongly granular; body length usually over 5 mm ..... *Augochlorella* [24]

82(79). Paraocular lobe extending down into clypeus as clearly obtuse angle [as in Fig. 180] (tropical) .... *Neocorynura* [30]

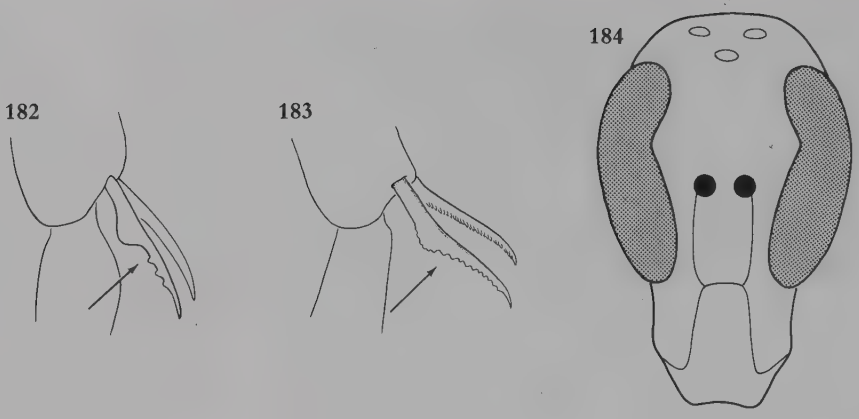
— Paraocular lobe extending down into clypeus as slightly obtuse, right, or acute angle [Fig. 179] ... 83

81(80). Espolón tibial posterior interno con pocos dientes cortos y redondeados, el basal más grande [Fig. 182]; área basal del propodeo fuertemente granulosa, estriada basalmente; largo del cuerpo aproximadamente 5 mm (tropical) .... *Pereirapis* [31]

— Espolón tibial posterior interno aserrado, dientecitos finos, redondeados [Fig. 183], espolón ensanchado cerca de la base; área basal del propodeo no fuertemente granulosa; largo del cuerpo usualmente más de 5 mm .... *Augochlorella* [24]

82(79). Lóbulo paraocular extendiéndose hacia abajo en el clípeo en ángulo claramente obtuso [como en Fig. 180] (tropical) ..... *Neocorynura* [30]

— Lóbulo paraocular extendiéndose hacia abajo en el clípeo en ángulo levemente obtuso, recto, o agudo [Fig. 179] 83



83(82). Head nearly twice as long as broad or longer [Fig. 184]; paraocular lobe acute; malar area much longer than broad, about one-fourth as long as eye or longer [Fig. 184] (rare, Panama, Costa Rica) .... *Chlerogella* [27]

— Head usually broader than long; paraocular lobe slightly obtuse or right angular (comparing epistomal suture near mandible with that below tentorial pit), although often broadly rounded or subtruncate; malar area much broader than long, extremely short or virtually absent [Fig. 179].....84

84(83). Preoccipital ridge rounded, vertex produced to rounded ridge above ocelli [Fig. 185]; eyes nearly glabrous (tropical to Texas) (see Appendix C; genus near *Megommation*) ..... *Pseudaugochloropsis* [32]

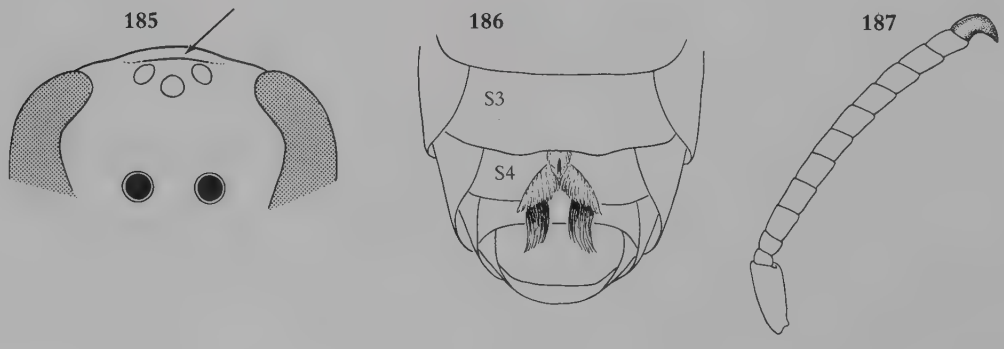
— Preoccipital ridge usually carinate, vertex not produced to ridge above ocelli; eyes usually with long hairs (tropical) ..... *Caenaugochlora* [26]

83(82). Cabeza casi dos veces más larga que ancha, o más larga [Fig. 184]; lóbulo paraocular agudo; área malar mucho más larga que ancha, aproximadamente un cuarto más larga que el ojo o mayor [Fig. 184] (raro, Panamá, Costa Rica) ..... *Chlerogella* [27]

— Cabeza usualmente más ancha que larga; lóbulo paraocular levemente obtuso o en ángulo recto (comparando la sutura epistomal cerca de la mandíbula con la misma sutura debajo de la tentorina), aunque frecuentemente ampliamente redondeado o subtruncado; área malar más ancha que larga, extremadamente corta o virtualmente ausente [Fig. 179] 84

84(83). Borde preoccipital redondeado, vértice elevado, formando un lomo transverso detrás de los ocelos [Fig. 185]; ojos casi glabros (tropical hasta Texas) (ver "Appendix C"; género cerca de *Megommation*) .... *Pseudaugochloropsis* [32]

— Borde preoccipital usualmente carenado, vértice no elevado formando un lomo transverso detrás de los ocelos; ojos usualmente con pelos largos (tropical) .... *Caenaugochlora* [26]



85(78). S4 with distinctive median or apical setal patches [Fig. 186] 86
— S4 without setal patches 87
86(85). Apical flagellomere hooked [Fig. 187]; preoccipital ridge rounded; eyes nearly glabrous (tropical to Texas) ..... *Pseudaugochloropsis* [32]
— Apical flagellomere not hooked; preoccipital ridge sharply angled or carinate; eyes usually with long hairs (tropical) ..... *Caenaugochlora* [26]
87(85). Paraocular lobe extending down into clypeus obtuse [as in Fig. 180]; basal part of metasoma slender, so that metasoma is petiolate [Fig. 170] (tropical) ... . *Neocorynura* [30]
— Paraocular lobe extending down into clypeus acute or right angular, although apex rounded [Fig. 179]; metasoma not petiolate 88
88(87). Head nearly twice as long as broad or longer [Fig. 184]; malar area much longer than broad, about one-fifth as long as eye or longer [Fig. 184] (rare, Panama, Costa Rica) ..... *Chlerogella* [27]
— Head usually broader than long; malar area much broader than long, extremely short or virtually absent 89
89(88). Paraocular lobe acute [Fig. 179]; marginal cell distinctly although narrowly truncate at apex [Fig. 181] ..... *Augochlora* [23]
— Paraocular lobe right angular [Fig. 180]; marginal cell pointed or nearly so [Fig. 119] 90
90(89). S4 broadly and rather strongly emarginate posteriorly, laterally with long, modified, thickened setae (usually hidden under lateral parts of T4) [Fig. 188]; body length about 5 mm (tropical) .... *Pereirapis* [31]
— S4 not or shallowly emarginate, without long lateral setae [Fig. 189]; body length usually over 5 mm (see Appendix C; genus near *Megommation*) .... *Augochlorella* [24]

85(78). S4 con áreas conspicuas de setas en la parte media o apical [Fig. 186] 86
— S4 sin áreas medias o apicales de setas 87
86(85). Flagelómero apical en gancho [Fig. 187]; borde preoccipital redondeado; ojos casi glabros (tropical hasta Texas) ..... *Pseudaugochloropsis* [32]
— Flagelómero apical no en gancho; borde preoccipital anguloso o carenado; ojos usualmente con pelos largos (tropical) ..... *Caenaugochlora* [26]
87(85). Lóbulo paraocular extendiéndose hacia abajo en el clípeo obtuso [como en Fig. 180]; metasoma con parte basal angosta, peciolado [Fig. 170] (tropical) .... *Neocorynura* [30]
— Lóbulo paraocular extendiéndose hacia abajo en el clípeo en ángulo recto o agudo, sin embargo ápice redondeado [Fig. 179]; metasoma no peciolado 88
88(87). Cabeza casi dos veces más larga que ancha o mayor [Fig. 184]; área malar mucho más larga que ancha, aproximadamente un quinto más larga que el ojo o mayor [Fig. 184] (raro, Panamá, Costa Rica) ..... *Chlerogella* [27]
— Cabeza usualmente más ancha que larga; área malar mucho más ancha que larga, extremadamente corta o virtualmente ausente 89
89(88). Lóbulo paraocular agudo [Fig. 179]; celda marginal con ápice brevemente trunco pero notorio [Fig. 181] .... *Augochlora* [23]
— Lóbulo paraocular en ángulo recto [Fig. 180]; celda marginal en punta o casi [Fig. 119] 90
90(89). S4 posteriormente con emarginación amplia, lateralmente con largas setas modificadas (usualmente ocultas debajo de las partes laterales de T4) [Fig. 188]; cuerpo aproximadamente 5 mm de largo (tropical) .... *Pereirapis* [31]
— S4 no emarginado, sin largas setas laterales [Fig. 189]; cuerpo usualmente más de 5 mm de largo (ver "Appendix C"; género cerca de *Megommation*) ..... *Augochlorella* [24]

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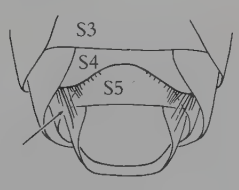

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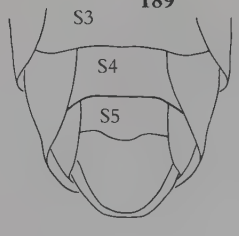
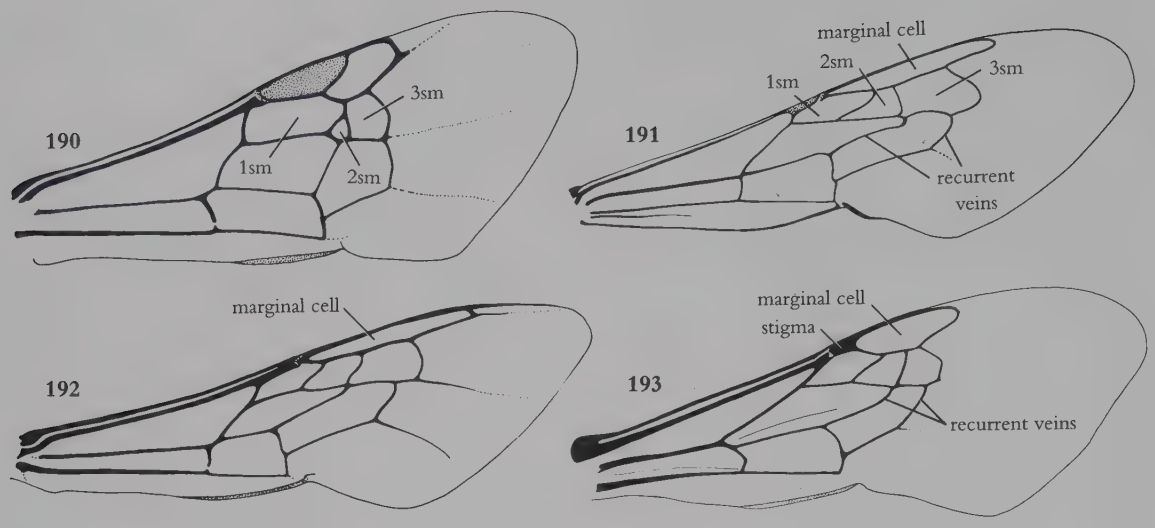




91(26). Second submarginal cell small, triangular, petiolate toward marginal cell [Fig. 190] (Andrenidae, Panurginae, part) ..... *Perdita* (part) [17]

— Second submarginal cell not unusually small, usually quadrate, if triangular not or scarcely petiolate [as in Fig. 191] 92

92(91). Marginal cell slender, seven times as long as broad and only a little over half as wide as widest submarginal cell [Figs. 191 and 192]; stigma absent [Figs. 191 and 192] (large, robust bees) (*Acanthopus* approaches these characters but should be run to 95; the enlarged, multidentate apex of middle tibial spur distinguishes it from genera that should go to 93.) 93

— Marginal cell six times as long as broad or less, much more than half as wide as widest submarginal cell [Fig. 193]; stigma usually distinct [Fig. 193], sometimes large 95

93(92). Posterior basitarsus longer than tibia; second submarginal cell greatly narrowed toward marginal cell [Fig. 191]; scopa largely on hind tibia [as in Fig. 116] (Anthophoridae, Xylocopinae, Xylocopini, part) ..... *Xylocopa* [150]

— Posterior basitarsus shorter than tibia; second submarginal cell at least half as broad on anterior as on posterior side [Fig. 192]; scopa well developed on hind trochanter and femur [as in Fig. 117] (Oxaeidae) 94

91(26). Segunda celda submarginal pequeña, triangular, peciolada sobre el lado hacia la celda marginal [Fig. 190] (Andrenidae, Panurginae, parte) ..... *Perdita* (parte) [17]

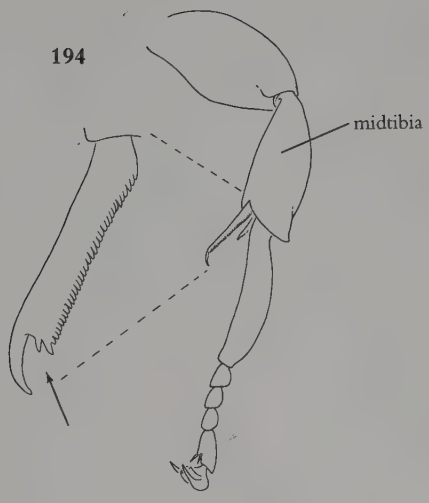
— Segunda celda submarginal no excepcionalmente pequeña, usualmente cuadrado, si triangular escasamente o no peciolada [como en Fig. 191] 92

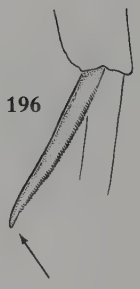
92(91). Celda marginal angosta, siete veces más larga que ancha y sólo un poco más de la mitad más ancha que la celda submarginal más ancha [Figs. 191 y 192]; estigma ausente [Figs. 191 y 192] (abejas grandes, robustas) (*Acanthopus* se aproxima a estos caracteres pero debe ir a 95; el gran ápice multidentado del espolón tibial medio lo distingue de los géneros que van a 93.) 93

— Celda marginal seis o menos veces más larga que ancha, mucho más de la mitad del ancho de la celda submarginal más ancha [Fig. 193]; estigma usualmente distinguible [Fig. 193], a veces grande 95

93(92). Basitarso posterior más largo que la tibia; segunda celda submarginal muy angostada hacia la celda marginal [Fig. 191]; escopa mayormente sobre la tibia posterior [como en Fig. 116] (Anthophoridae, Xylocopinae, Xylocopini, parte) ..... *Xylocopa* [150]

— Basitarso posterior más corto que la tibia; segunda celda submarginal con lado anterior al menos la mitad del ancho del lado posterior [Fig. 192]; escopa bien desarrollada sobre el trocánter y el fémur posteriores [como en Fig. 117] (Oxaeidae) 94





94(93). Metasomal terga or bands on them metallic green; maxillary palpus absent (rare, tropical) .... *Oxaea* [21]

— Metasomal terga black, sometimes with iridescent metallic tints; maxillary palpus six-segmented (SW) (Subgroups sometimes recognized as genera are characterized in "Notes.") ..... *Protoxaea* [22]

95(92). Middle tibial spur notched [Fig. 194], bifid, or multidentate [Fig. 195] at apex; scopa absent; metasomal vestiture including metallic green or blue scales or forming striking pale brownish to white and black patches of scales, or rarely integument bright metallic blue or green (Anthophoridae, Anthophorinae, Ericrocidini) 96

— Middle tibial spur pointed [Fig. 196], not notched or bifid (although with a preapical shoulder in *Epicharis*); scopa present or absent; metasomal vestiture variable in color but not metallic green or blue, usually not scalelike; integument not bright metallic blue or green 101

96(95). Metasomal vestiture forming black and white (to tawny) broken bands (mostly SW) ..... *Ericrocis* [97]

— Metasomal vestiture including green or blue metallic scales or, if not, then integument green or blue (tropical) 97

97(96). Third submarginal cell receiving both recurrent veins [as in Fig. 191]; hind basitarsus very long, with dense brush of long, dark, plumose hairs (rare) .... *Acanthopus* [94]

94(93). Tergos del metasoma verde metálico o con bandas de este color; palpo maxilar ausente (raro, tropical) .... *Oxaea* [21]

— Tergos del metasoma negros, a veces con tinte metálico iridiscente; palpo maxilar con seis segmentos (SW) (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") ..... *Protoxaea* [22]

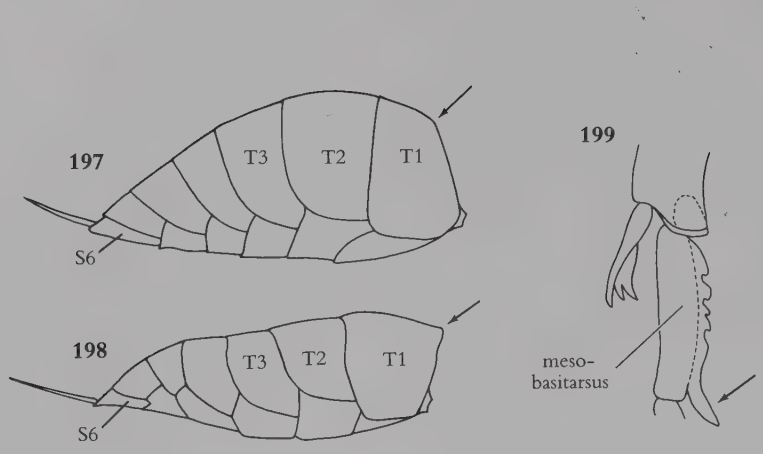
95(92). Espolón tibial medio con muesca apical [Fig. 194] o bífido o multidentado [Fig. 195]; escopa ausente; metasoma con pelos escamosos azul o verde metálico, o formando conspícuas áreas negras y blancas a castaño claro, o raramente con tegumento metálico brillante, azul o verde (Anthophoridae, Anthophorinae, Ericrocidini) 96

— Espolón tibial medio aguzado [Fig. 196], no bífido ni con muesca (aunque con ángulo romo preapical en *Epicharis*); con o sin escopa; pubescencia del metasoma de color variable, pero no azul ni verde metálico, usualmente pelos no escamosos; tegumento no azul o verde metálico brillante 101

96(95). Metasoma con pubescencia formando bandas entrecortadas negras y blancas (a castañas) (mayormente SW) .... *Ericrocis* [97]

— Metasoma con pelos escamosos azul o verde metálico o, si no, con tegumento azul o verde (tropical) 97

97(96). Tercera celda submarginal recibiendo ambas venas recurrentes [Fig. 191]; basitarso posterior muy largo, con un denso cepillo de pelos largos, oscuros, y plumosos (raro) ..... *Acanthopus* [94]



— Second and third submarginal cells of forewing each receiving a recurrent vein [Fig. 193]; hind basitarsus without dense brush of long, dark, plumose hairs... 98

98(97). Juncture of basal and discal surfaces of T1 rounded, never appearing angulate [Fig. 197]; mesobasitarsus with distal, flattened process on posterior margin, often continued basad as a cariniform ridge [Fig. 199]; mandible usually with preapical tooth (uncommon) ..... *Mesoplia* [99]

— Juncture of basal and discal surfaces of T1 angulate [Fig. 198]; mesobasitarsus without distal, flattened, spinelike projection on posterior margin; mandible simple 99

99(98). Scutellum with two flat, platelike lobes directed caudad over metanotum and propodeum [Fig. 200] (forewing dusky, with an apical cloud in marginal cell in addition to that at wing apex) (uncommon) ..... *Mesocheira* [98]

— Scutellum bituberculate, with stout, subconical, and suberect projections [Fig. 201] 100

100(99). Pronotum carinate between collar and lobe [Fig. 202]; mesepisternum with lamelliform ridge between anterior and lateral surfaces [Fig. 202]; male antenna normal, not extending much beyond tegula (rare) ..... *Aglaomelissa* [95]

— Pronotum not carinate between collar and lobe, end of collar clearly defined; mesepisternum abruptly rounded between anterior and lateral surfaces; male flagellar segments greatly elongate, flagellum ex-

— Celdas primera y segunda submarginal del ala anterior recibiendo una vena recurrente cada una [Fig. 193]; basitarso posterior sin cepillo denso de pelos largos, oscuros, y plumosos..... 98

98(97). T1 con la unión de las superficies basal y discal redondeada, nunca de apariencia angulosa [Fig. 197]; basitarso medio con proceso distal aplanado en el margen posterior, frecuentemente continuado hacia la base en forma de borde cariniforme, levantado [Fig. 199]; mandíbula usualmente con diente preapical (poco común) .... *Mesoplia* [99]

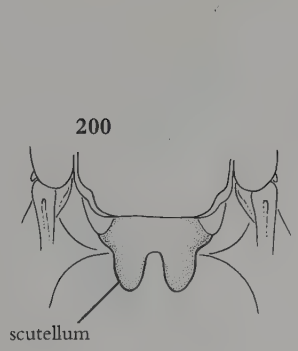
— T1 con la unión de las superficies basal y discal angulosa [Fig. 198]; basitarso medio sin proyección distal aplanada y en forma de espina en el margen posterior; mandíbula simple 99

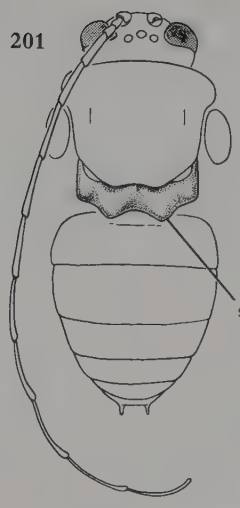
99(98). Escutelo con dos lóbulos planos y delgados proyectados caudalmente sobre metanoto y propodeo [Fig. 200] (ala anterior levemente ahumada con una mancha oscura en el ápice de la celda marginal y otra en el ápice del ala) (poco común) ..... *Mesocheira* [98]

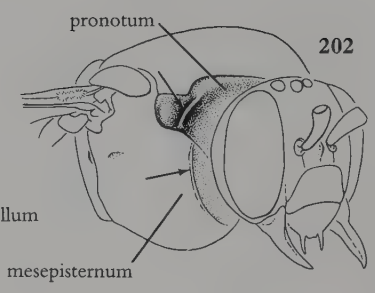
— Escutelo bituberculado, estos procesos fuertes, subcónicos, y suberectos [Fig. 201] 100

100(99). Pronoto carenado entre collar y lóbulo pronotal [Fig. 202]; superficies lateral y anterior del mesepisterno separadas por un borde lameliforme [Fig. 202]; macho con antena normal, no extendiéndose mucho más alla de la tégula (raro) ..... *Aglaomelissa* [95]

— Pronoto no carenado entre collar y lóbulo pronotal, terminación del collar claramente definida; unión de las superficies anterior y lateral del mesepisterno abruptamente redondeada; flagelómeros del macho muy alargados, so-







tending well beyond apex of metasoma [Fig. 201] (rare) ..... *Ctenioschelus* [96]

101(95). Metasoma of female tapering (as in *Coelioxys*) [Fig. 203]; S6 elongate, tapering to acute point beyond apex of T6, forming tube containing sting; T6 of female twice as long as basal width; male without hind tibial spurs; male metasoma tapering as in female but ending in dense brush on T7 (Anthophoridae, Anthophorinae, Tetrapediini, part) (rare, tropical) ..... *Coelioxoides* [132]

— Metasoma not tapering as in *Coelioxys;* S6 not so elongate, usually not acutely pointed; T6 of female as long as its basal width or shorter; hind tibial spurs present; male metasoma not ending in brush 102

102(101). Arolia absent [Fig. 204] 103

— Arolia present [Fig. 205] 108

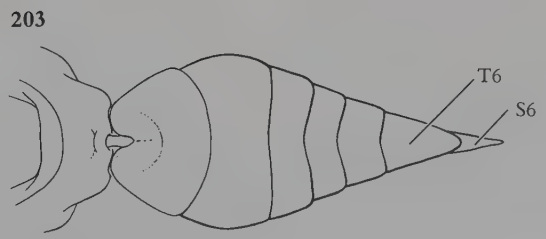
brepasando bastante el ápice del metasoma [Fig. 201] (raro) ..... *Ctenioschelus* [96]

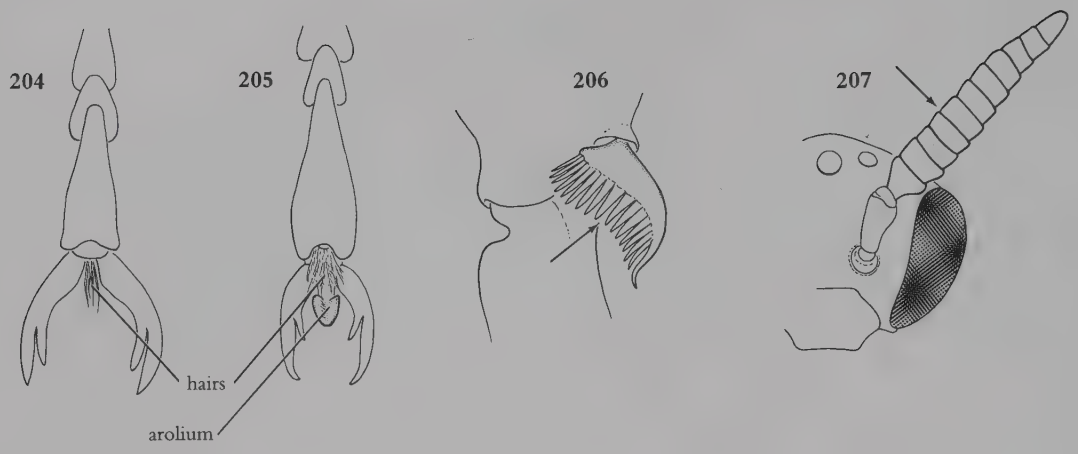
101(95). Hembra con metasoma cónico (como en *Coelioxys*) [Fig. 203]; S6 alargado, angostándose y terminando en punta más allá del ápice de T6, formando un tubo que contiene el aguijón; hembra con T6 dos veces más largo que el ancho basal; macho sin espolones tibiales posteriores; macho con metasoma también cónico, pero T7 terminado en un cepillo denso (Anthophoridae, Anthophorinae, Tetrapediini, parte) (raro, tropical) .... *Coelioxoides* [132]

— Metasoma no cónico como en *Coelioxys;* S6 no así alargado, usualmente no aguzado; hembra con T6 tan largo como o más corto que el ancho basal; espolones tibiales posteriores presentes; macho con metasoma no terminado en cepillo 102

102(101). Arolios ausentes [Fig. 204] 103

— Arolios presentes [Fig. 205] 108





103(102). Outer hind tibial spur absent, inner spur and middle tibial spur coarsely pectinate [Fig. 206] (Anthophoridae, Anthophorinae, Tetrapediini, part) (tropical) ..... *Tetrapedia* [133]

— Hind tibia with the usual two spurs; tibial spurs simple, minutely serrate or ciliate along margins [Fig. 183] 104

104(103). Scopa absent; flagellum of male greatly thickened, middle segments several times as wide as long [Fig. 207]; marginal cell less than twice as long as stigma and not extending beyond third submarginal cell [Fig. 208] (Anthophoridae, Anthophorinae, Melectini, part) (W) ..... *Zacosmia* [126]

— Scopa conspicuous on hind tibia of female; flagellum of male not thickened, middle segments at most twice as wide as long; marginal cell much more than twice as long as stigma and extending beyond third submarginal cell [Figs. 209–211] 105

105(104). Second submarginal cell much shorter than first and smaller than first and third [Fig. 209]; stigma distinct, longer than broad [Fig. 209] (Anthophoridae, Anthophorinae, Emphorini, part) .... *Ptilothrix* [93]

— Second submarginal cell equal to or longer than first on posterior margin [Figs. 210 and 211]; third submarginal cell smaller than others; stigma a small transverse structure [Figs. 210 and 211] (Anthophoridae, Anthophorinae, Centridini, part) 106

103(102). Espolón tibial posterior externo ausente, espolón interno y espolón tibial medio gruesamente pectinados [Fig. 206] (Anthophoridae, Anthophorinae, Tetrapediini, parte) (tropical) ..... *Tetrapedia* [133]

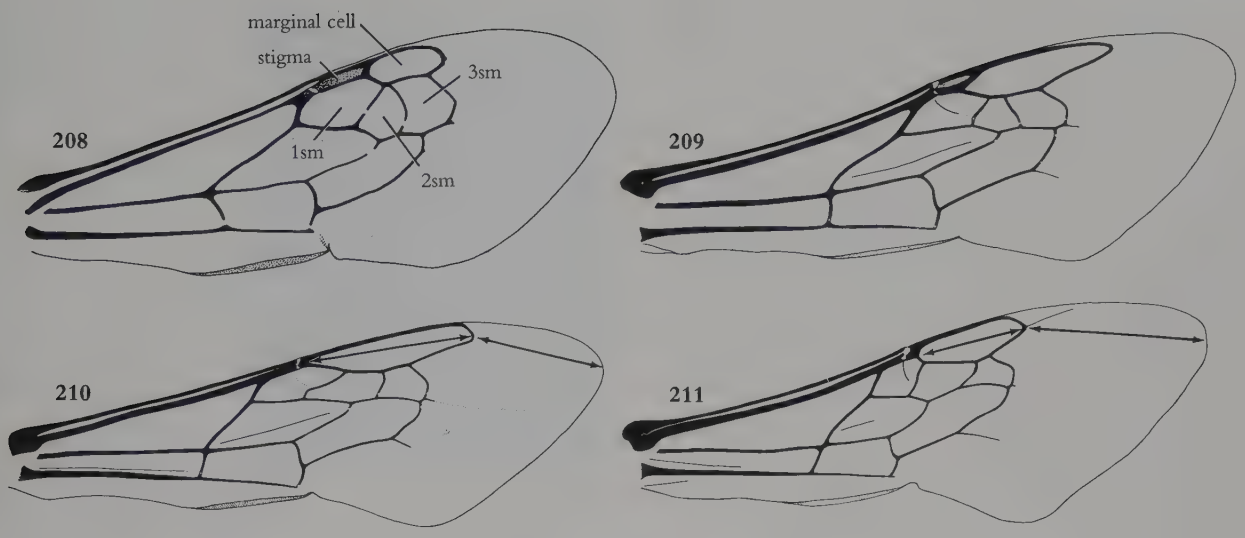
— Tibia posterior con los dos espolones usuales; espolones con márgenes simples, finamente aserrados o ciliados [Fig. 183] 104

104(103). Escopa ausente; flagelo del macho grandemente engrosado, segmentos medios varias veces más anchos que su largo [Fig. 207]; celda marginal menos de dos veces del largo del estigma y no excediendo la tercera celda submarginal [Fig. 208] (Anthophoridae, Anthophorinae, Melectini, parte) (W) ..... *Zacosmia* [126]

— Hembra con escopa conspicua en la tibia posterior; flagelo del macho no engrosado, segmentos medios a lo sumo dos veces más anchos que su largo; celda marginal mucho más de dos veces del largo del estigma y extendiéndose más allá de la tercera celda submarginal [Figs. 209–211] 105

105(104). Segunda celda submarginal mucho más corta que la primera y menor que ésta o la tercera [Fig. 209]; estigma conspicuo, más largo que ancho [Fig. 209] (Anthophoridae, Anthophorinae, Emphorini, parte) .... *Ptilothrix* [93]

— Segunda celda submarginal con el margen posterior igual o más largo que el de la primera [Figs. 210 y 211]; tercera celda submarginal menor que las otras; estigma como una pequeña estructura transversa [Figs. 210 y 211] (Anthophoridae, Anthophorinae, Centridini, parte) 106



106(105). Marginal cell longer than distance from apex to wing tip [Fig. 210]; a few extraordinarily long, whiplike setae arising from preoccipital ridge behind summit of eye and usually reaching as far as anterior margin of tegula [Fig. 212] (tropical) .... *Epicharis* [89]

— Marginal cell shorter than distance from apex to wing tip [Fig. 211]; extraordinarily long setae arising from preoccipital ridge present or absent 107

107(106). Long whiplike setae arising from preoccipital ridge absent; basitibial plate of female usually containing a basal, secondary plate or elevated area sometimes weakly defined [Fig. 213]; T2 and T3 of female with gradulus simple, transverse ..... *Centris* [88]

— A few long whiplike setae from preoccipital ridge present, attaining anterior margin of scutum [as in Fig. 212]; basitibial plate of female not containing secondary plate [as in Figs. 174 and 175]; T2 and T3 of female with gradulus angulate posteriorly middorsally, on either side of this angulation a depression filled with erect plumose hairs (rare, tropical) ..... *Ptilotopus* [90]

108(102). Scutellum strongly convex in profile, posterior margin (at least behind spines or tubercles when these are present) at nearly right angles to anterior

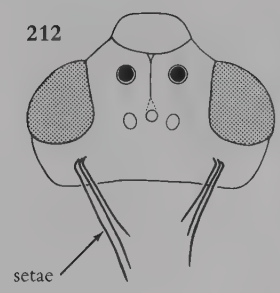
106(105). Celda marginal más larga que la distancia de su ápice al ápice del ala [Fig. 210]; con unas pocas setas extraordinariamente largas, flageliformes, naciendo del borde preoccipital detrás del ojo y usualmente alcanzando tan atrás como el margen anterior de la tégula [Fig. 212] (tropical) ..... *Epicharis* [89]

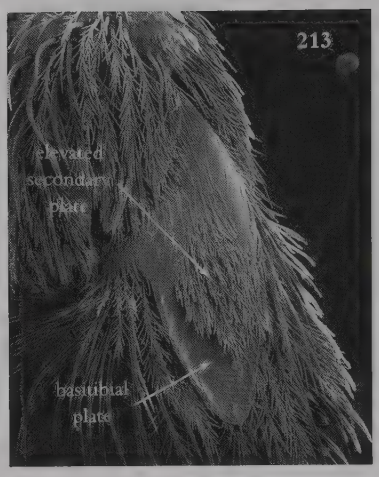
— Celda marginal más corta que la distancia de su ápice al ápice del ala [Fig. 211]; setas extraordinariamente largas naciendo del borde preoccipital presentes o ausentes 107

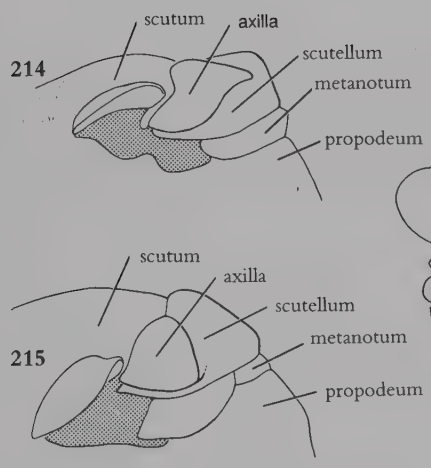
107(106). Sin setas largas, flageliformes, naciendo del borde preoccipital; placa basitibial de la hembra usualmente conteniendo una placa secundaria basal o un area elevada a veces débilmente definida [Fig. 213]; T2 y T3 de la hembra con grádulo simple, transverso..... *Centris* [88]

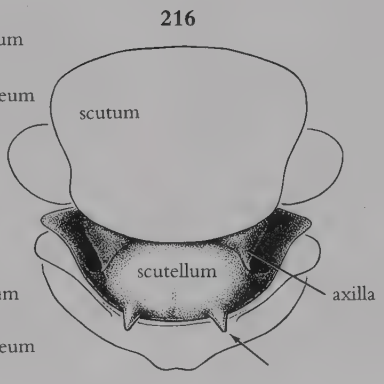
— Con algunas setas largas, flageliformes, naciendo del borde preoccipital que alcanzan el borde anterior del escudo [como en Fig. 212]; placa basitibial de la hembra no conteniendo una placa secundaria [como en Figs. 174 y 175]; T2 y T3 de la hembra con grádulo anguloso hacia atrás dorsomedialmente, a cada lado de este ángulo con una depresión rellena con pelos plumosos erectos (raro, tropical) ..... *Ptilotopus* [90]

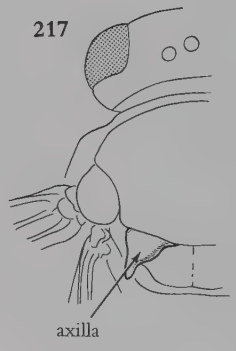
108(102). Escutelo con perfil fuertemente convexo, borde posterior (al menos detrás de espinas o tubérculos cuando éstos están presentes) en ángulo casi recto con la parte











part [Fig. 214]; scutellar surface sometimes bilobed, bituberculate, or bispinose [Fig. 216]; metanotum declivous, as is profile of propodeum [Fig. 214] 109

— Scutellum less strongly convex, posterior third at angle of 110° or more to anterior part [Fig. 215]; scutellar surface not bituberculate; metanotum often more nearly horizontal as is frequently base of propodeum 117

109(108). Axilla produced posteriorly to angle or spine lateral to scutellum, rarely rounded but protruding as lobe not continuing contour of scutellum [Figs. 214 and 217] (Anthophoridae, Nomadinae, Epeolini, part) 110

— Axilla simple, not produced [Fig. 216], usually continuing contour of scutellar margin 113

superior [Fig. 214]; escutelo a veces bilobado, bituberculado, o biespinoso [Fig. 216]; metanoto en declive, como el perfil del propodeo [Fig. 214] 109

— Escutelo menos fuertemente convexo, tercio posterior y parte superior en ángulo de 110° o más [Fig. 215]; escutelo no bituberculado; metanoto frecuentemente casi horizontal, al igual que la base del propodeo 117

109(108). Axila proyectada posteriormente en ángulo o espina lateral al escutelo, raramente redondeada pero sobresaliente en forma de lóbulo que no continúa el contorno del escutelo [Figs. 214 y 217] (Anthophoridae, Nomadinae, Epeolini, parte) 110

— Axila simple, no proyectada [Fig. 216], usualmente continuando el contorno del margen del escutelo 113

110(109). Body largely covered with brilliant metallic blue-green scalelike hairs (rare, tropical) .... *Thalestria* [139]

— Body without metallic hairs 111

111(110). Vein r arising near middle of stigma or three-fifths of stigmal length from base [Fig. 218]; margin of stigma in marginal cell convex [Fig. 218]; greatest length of marginal cell subequal to greatest total length of the three submarginal cells; T5 of female with small, basal, longitudinal, oval area depressed or surrounded by carinae (rare, tropical) .... *Odyneropsis* [138]

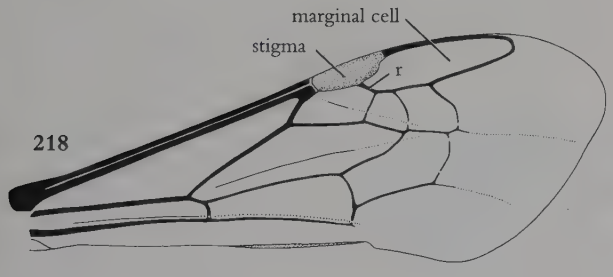
— Vein r arising near apex of stigma [Fig. 219]; margin of stigma in marginal cell not convex [Fig. 219]; greatest length of marginal cell usually distinctly less than length of the three submarginal cells; no defined oval area on T5 of female 112

110(109). Cuerpo extensamente cubierto con pelos escamosos azul-verde metálico brillante (raro, tropical) .... *Thalestria* [139]

— Cuerpo sin pelos metálicos 111

111(110). Vena r naciendo cerca de la mitad o los tres quintos apicales del estigma [Fig. 218]; estigma dentro de la celda marginal con borde convexo [Fig. 218]; largo máximo de la celda marginal subigual al largo máximo de las tres celdas submarginales; T5 de la hembra con pequeña área basal oval, longitudinal, y deprimida o rodeada por una carena (raro, tropical) ..... *Odyneropsis* [138]

— Vena r naciendo cerca del ápice del estigma [Fig. 219]; estigma dentro de la celda marginal no convexo [Fig. 219]; usualmente largo máximo de la celda marginal claramente menos que el largo de las tres celdas submarginales; T5 de la hembra sin área oval carenada 112



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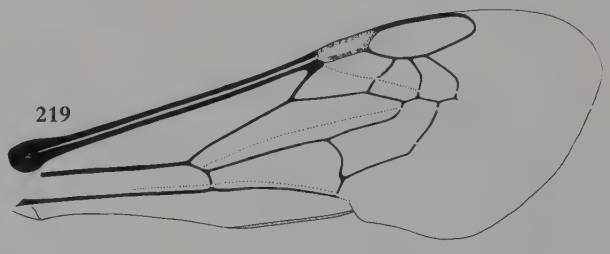
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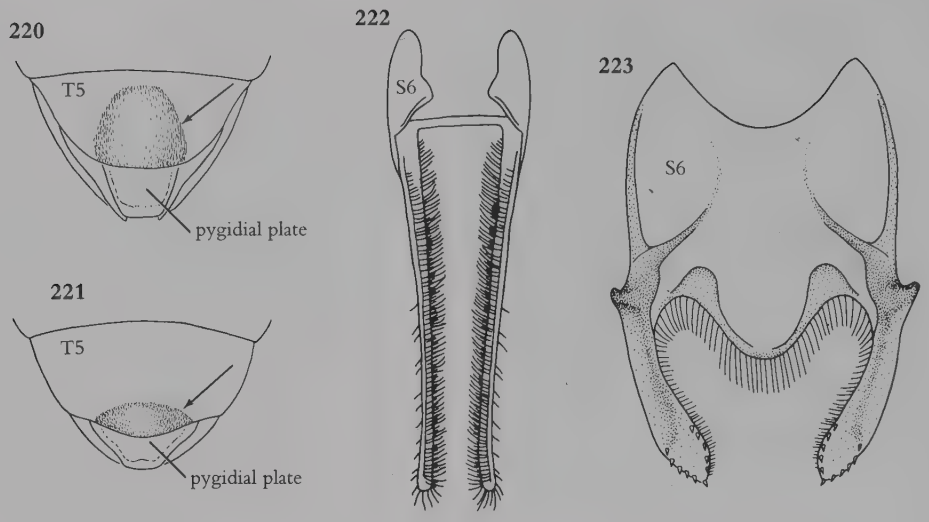
112(111,181). T5 of female with a dark, beveled, pseudopygidial area, usually at least half as long as broad [Fig. 220]; S6 of female with disc reduced to a transverse bar connecting a pair of slender lateral processes armed apically with coarse, spinelike setae [Fig. 222]; pygidial plate of male usually more or less parallel-sided posteriorly, widened anteriorly, so that lateral margins are sinuate; maxillary palpi usually three-segmented ..... *Triepeolus* [140]

— T5 of female with apical portion bearing short silvery pubescence, this area usually on same plane as rest of tergum and less than half as long as broad [Fig. 221]; S6 of female with large disc and a pair of apical, spatulate, spiculate processes [Fig. 223]; pygidial plate of male with lateral margins convergent,

112(111, 181). T5 de la hembra con un área pseudopigidial oscura, biselada, usualmente por lo menos la mitad tan larga como ancha [Fig. 220]; S6 de la hembra con disco reducido a una barra transversa que conecta un par de angostos procesos laterales armados apicalmente con setas gruesas, como espinas [Fig. 222]; placa pigidial del macho usualmente más o menos paralela posteriormente y ensanchada anteriormente, de modo que los lados son sinuosos; palpos maxilares usualmente con tres segmentos .... *Triepeolus* [140]

— T5 de la hembra con porción apical con pubescencia corta, plateada, usualmente esta área ubicada en el mismo plano que el resto del tergo y menos de la mitad tan larga como ancha [Fig. 221]; S6 de la hembra con disco grande y par de procesos apicales espatulados, espiculados [Fig.



not sinuate; maxillary palpi usually two-segmented (Subgroups sometimes recognized as genera are characterized in "Notes.") ..... *Epeolus* [137]

113(109). Marginal cell longer than distance from its apex to wing tip [Fig. 224]; body without areas of appressed pale pubescence (or most of T1 and T2 covered with such pubescence); wings hairy throughout, not or scarcely papillate [Fig. 229] 114

— Marginal cell much shorter than distance from its apex to wing tip [Fig. 225]; body with patches (sometimes very small) of appressed pale pubescence; wings with large bare areas and apically with coarse papillae [Fig. 228] (Anthophoridae, Anthophorinae, Melectini, part) 116

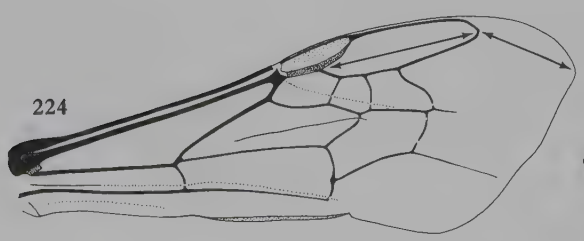
114(113). Hind tibia and basitarsus of both sexes with abundant hair at least as long as diameter of leg, in female forming scopa (Anthophoridae, Anthophorinae, Exomalopsini, part) (tropical) ..... *Paratetrapedia* (part) [122]

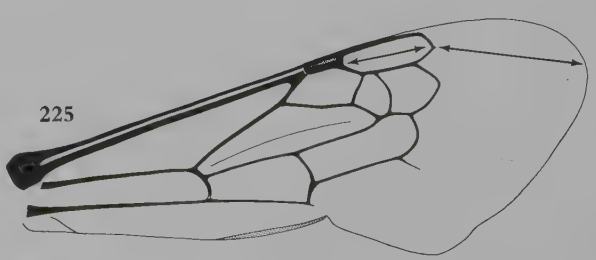
223]; placa pigidial del macho con lados convergentes, no sinuosos; palpos maxilares usualmente con dos segmentos (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") ..... *Epeolus* [137]

113(109). Celda marginal más larga que la distancia de su ápice al ápice del ala [Fig. 224]; cuerpo sin áreas de pubescencia clara aplastada (o T1 y T2 en su mayor parte cubiertos con esa pubescencia); alas completamente pilosas, poco o nada papiladas [Fig. 229] 114

— Celda marginal mucho más corta que la distancia de su ápice al ápice del ala [Fig. 225]; cuerpo con áreas (a veces muy pequeñas) de pubescencia clara, aplastada; alas con grandes áreas glabras y apicalmente con gruesas papilas [Fig. 228] (Anthophoridae, Anthophorinae, Melectini, parte) 116

114(113). Tibia y basitarso posteriores en ambos sexos con pelos abundantes al menos tan largos como el diámetro de la pata, en la hembra formando una escopa (Anthophoridae, Anthophorinae, Exomalopsini, parte) (tropical) ..... *Paratetrapedia* (parte) [122]





— Hind tibia and basitarsus without long hair; scopa absent 115

115(114). Body length over 15 mm; T7 of male bidentate, without pygidial plate (Anthophoridae, Anthophorinae, Rhathymini) (rare, tropical) ..... *Rhathymus* [131]

— Body length under 11 mm; T7 of male not bidentate, with small elevated pygidial plate (Anthophoridae, Anthophorinae, Osirini, part) (very rare, central and eastern North America) ..... *Epeoloides* [127]

116(113). Inner rami of claws of middle and posterior legs broad, vertically expanded, lobelike although subtruncate or pointed, not shaped like outer rami [Fig. 226]; T1 without or almost without long hair similar to that of thorax ..... *Xeromelecta* [125]

— Inner rami of claws of middle and posterior legs pointed more or less like outer rami, not wider than outer rami [Fig. 227]; T1 with long hair like that of thorax ..... *Melecta* [124]

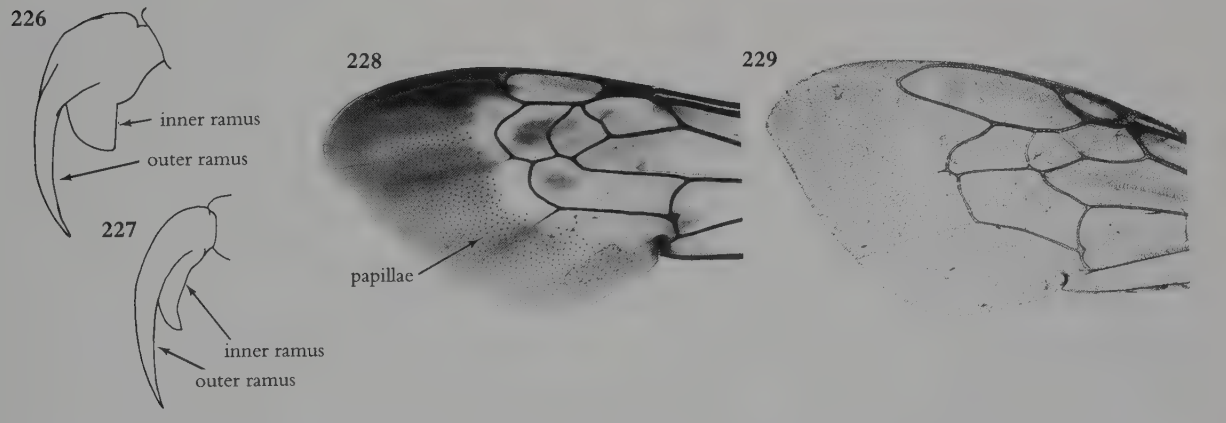
— Tibia y basitarso posteriores sin pelos largos; escopa ausente 115

115(114). Cuerpo más de 15 mm de largo; T7 del macho bidentado, sin placa pigidial (Anthophoridae, Anthophorinae, Rhathymini) (raro, tropical) ..... *Rhathymus* [131]

— Cuerpo menos de 11 mm de largo; T7 del macho no bidentado, con placa pigidial elevada, pequeña (Anthophoridae, Anthophorinae, Osirini, parte) (muy raro, centro y este de América del Norte) ..... *Epeoloides* [127]

116(113). Rama interna de las uñas de las patas medias y posteriores ancha, verticalmente expandida, lobulada, aunque subtrunca o aguzada, de forma diferente a la rama externa [Fig. 226]; T1 sin o casi sin pelos largos como los del tórax ..... *Xeromelecta* [125]

— Rama interna de las uñas de las patas medias y posteriores aguzada, similar y no más ancha que la rama externa [Fig. 227]; T1 con largos pelos como los del tórax ..... *Melecta* [124]



117(108). Closed cells of forewing largely hairless [Fig. 228]; wing surface beyond veins coarsely papillate and hairless (Anthophoridae, Anthophorinae, Anthophorini) 118

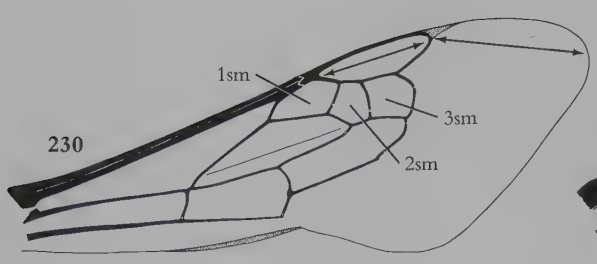
— Entire forewing with numerous minute hairs [Fig. 229]; wing surface beyond veins not papillate or, if so, with many papillae ending in hairs or with hairs intermixed with papillae 120

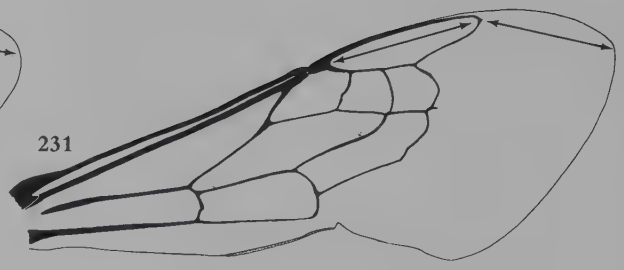
118(117). Marginal cell shorter than distance from its apex to wing tip, submarginal cells subtending more than half of its length [Fig. 230]; anterior and poste-

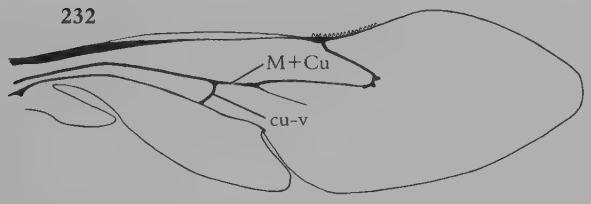
117(108). Celdas cerradas del ala anterior mayormente glabras [Fig. 228]; superficie alar más allá de las venas, glabra y con papilas gruesas (Anthophoridae, Anthophorinae, Anthophorini) 118

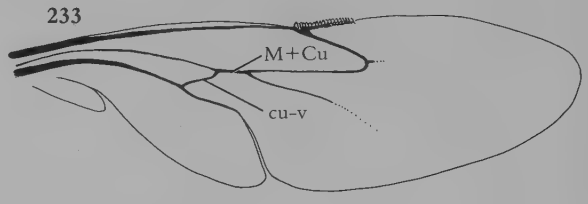
— Toda el ala anterior con numerosos pelitos finos [Fig. 229]; superficie alar después de las venas no papilada o, si así fuese, muchas papilas terminadas en pelos o pelos y papilas mezclados 120

118(117). Celda marginal más corta que la distancia de su ápice al ápice del ala, más de la mitad de su largo subtendida por las celdas submarginales [Fig. 230]; márgenes anterior y









rior margins of third submarginal cell subequal; first recurrent vein ending near middle of second submarginal cell ..... *Anthophora* [85]

— Marginal cell about as long as distance from its apex to wing tip, submarginal cells subtending about half of its length [Fig. 231]; anterior margin of third submarginal cell shorter than posterior margin; first recurrent vein ending near apex of second submarginal cell 119

119(118). Vein cu-v of hind wing approximately transverse and much shorter than second abscissa of M+Cu [Fig. 232]; proboscis in repose reaching hind coxae or nearly so (Mesoamerica) .... *Deltoptila* [86]

— Vein cu-v of hind wing slanting and about as long as second abscissa of M+Cu [Fig. 233]; proboscis in repose not reaching beyond forecoxae..... ..... *Habropoda* [87]

120(117). Body shiny, no areas covered by dense hairs, often metallic; clypeus of female usually with short longitudinal median white or yellow bar; hairs short and sparse, not forming metasomal bands; body slender; pygidial plate absent but T6 of female pointed [Fig. 234] (Anthophoridae, Xylocopinae, Ceratinini, part) ..... *Ceratina* (part) [149]

— Body not shiny or else with areas covered by hairs,

posterior de la tercera celda submarginal subiguales; primera vena recurrente terminando cerca de la mitad de la segunda celda submarginal ..... *Anthophora* [85]

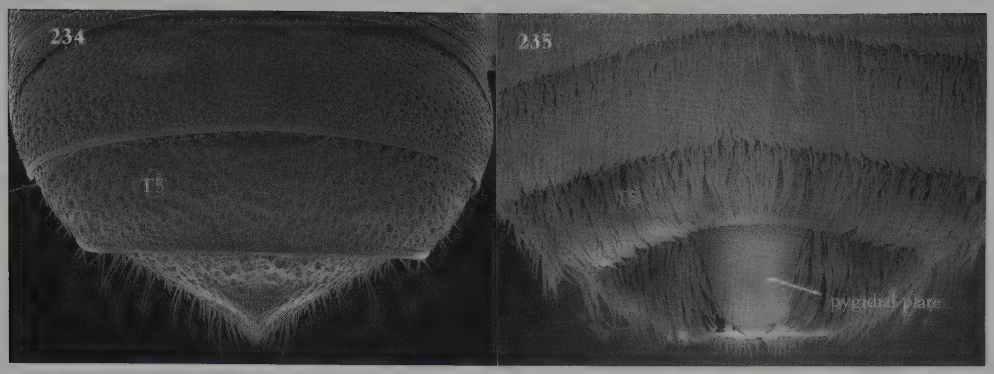
— Celda marginal aproximadamente tan larga como la distancia de su ápice al ápice del ala, aproximadamente la mitad de su largo subtendida por las celdas submarginales [Fig. 231]; tercera celda submarginal con margen anterior más corto que el posterior; primera vena recurrente terminando cerca del ápice de la segunda celda submarginal 119

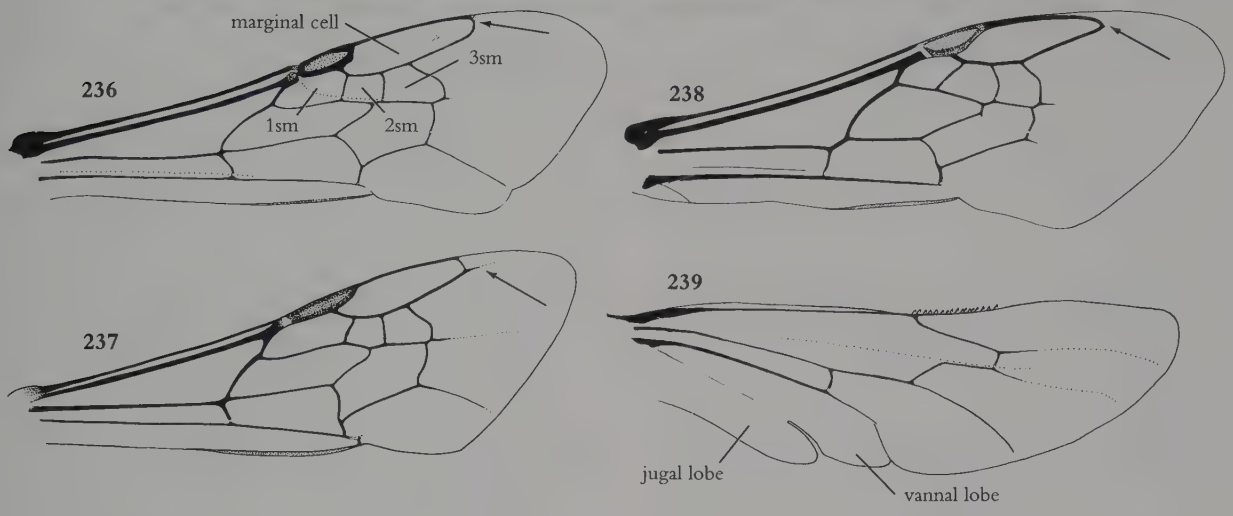
119(118). Vena cu-v del ala posterior aproximadamente transversa y mucho más corta que la segunda abscisa de M+Cu [Fig. 232]; proboscis en reposo alcanzando las coxas posteriores o casi (Mesoamérica).... *Deltoptila* [86]

— Vena cu-v del ala posterior oblicua y casi tan larga como la segunda abscisa de M+Cu [Fig. 233]; proboscis en reposo no alcanzando más allá de las coxas anteriores .... *Habropoda* [87]

120(117). Cuerpo brillante, sin áreas cubiertas por pelos densos frecuentemente metálico; clípeo de la hembra usualmente con una barra corta longitudinal media blanca o amarilla; pelos cortos y ralos, sin formar bandas metasomales; cuerpo delgado; placa pigidial ausente pero T6 de la hembra en punta [Fig. 234] (Anthophoridae, Xylocopinae, Ceratinini, parte) ..... *Ceratina* (parte) [149]

— Cuerpo no brillante o cuerpo con áreas cubiertas por





not metallic; clypeus of female without longitudinal median pale bar; hairs dense and often obscuring surface in some areas, often forming metasomal bands; body usually robust; pygidial plate usually present [as in Fig. 235] 121

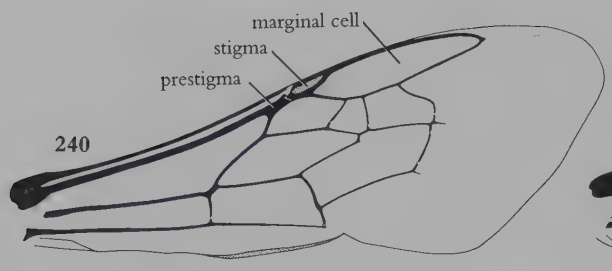
121(120). Marginal cell with apex rounded but on or almost on wing margin [Fig. 236]; first and third submarginal cells subequal in length of posterior margins, ordinarily much longer than second, which is quadrate; jugal lobe of hind wing about three-fourths as long as vannal lobe [Fig. 239] (Halictidae, Nomiinae) ..... back to 36

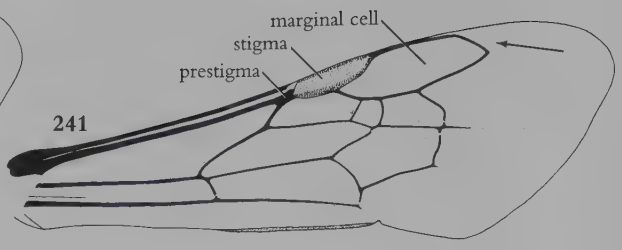
— Marginal cell with apex truncate or bent well away from wing margin [Figs. 237 and 238]; submarginal cells not as above; jugal lobe of hind wing usually much less than three-fourths as long as vannal lobe 122

pelos densos, no metálico; clípeo de la hembra sin barra longitudinal media clara; pelos densos, más largos, y ocultando frecuentemente la superficie en algunas áreas, formando frecuentemente bandas metasomales; cuerpo usualmente robusto; placa pigidial usualmente presente [como en Fig. 235] 121

121(120). Celda marginal con ápice redondeado pero sobre o casi sobre el margen alar [Fig. 236]; primera y tercera celdas submarginales subiguales en largo (sobre el margen posterior), comúnmente mucho más largas que la segunda, que es cuadrada; lóbulo yugal del ala posterior aproximadamente tres cuartos del largo del lóbulo vanal [Fig. 239] (Halictidae, Nomiinae) ..... volver a 36

— Celda marginal con ápice trunco o curvado bien alejado del margen alar [Figs. 237 y 238]; celdas submarginales no como arriba; lóbulo yugal del ala posterior usualmente mucho menos de tres cuartos del largo del lóbulo vanal 122





122(121). Posterior margin of first submarginal cell at least 1.3 times as long as third [Fig. 237]; body elongate (like *Andrena* or *Halictus*); proboscis short; segments of labial palpus similar or only first elongate [as in Fig. 8] 123

— Posterior margin of first submarginal cell shorter than to scarcely longer than third [Figs. 238 and 240] or nearly 1.3 times as long as third in *Ancyloscelis, Exomalopsis,* and others [Fig. 241], which have short, robust bodies; body commonly robust; proboscis long; first two segments of labial palpus elongate, flattened, entirely different from segments 3 and 4 [as in Fig. 6] 125

123(122). Body extraordinarily coarsely punctate; certain metasomal terga with yellow to white integumental bands; preoccipital ridge formed as strong lamella (Colletidae, Colletinae, part) (uncommon, tropical to Arizona) ..... *Eulonchopria* [2]

— Body not especially coarsely punctate; metasoma without integumental bands; preoccipital ridge not lamellate 124

124(123). Third submarginal cell longer than second [Fig. 237]; clypeus of male and commonly of female with yellow; scopa primarily on tibia of female [as in Fig. 345] (Andrenidae, Panurginae, part) .... *Protandrena* [18]

— Third submarginal cell shorter than second [as in Fig. 238]; face without yellow markings (except when much of head is yellow); scopa primarily on femur of female [as in Fig. 344] (Colletidae, Diphaglossinae, Dissoglottini, part) (rare, tropical) .... *Mydrosoma* (part) [6]

125(122). Pygidial plate absent or so modified as to be unrecognizable in both sexes; basitibial plate absent;

122(121). Primera celda submarginal sobre el margen posterior al menos 1,3 veces tan larga como la tercera [Fig. 237]; cuerpo alargado (como *Andrena* o *Halictus*); proboscis corta; segmentos del palpo labial similares o sólo el primero alargado [como en Fig. 8] 123

— Primera celda submarginal sobre el margen posterior más corta o poco más larga que la tercera [Figs. 238 y 240] o casi 1,3 veces tan larga como la tercera en *Ancyloscelis, Exomalopsis,* y otros [Fig. 241], que tienen cuerpo corto y robusto; cuerpo comúnmente robusto; proboscis larga; palpo labial con los primeros dos segmentos alargados, planos, enteramente diferentes de los segmentos 3 y 4 [como en Fig. 6] 125

123(122). Cuerpo con puntos extraordinariamente fuertes; tegumento de algunos tergos del metasoma con bandas amarillas a blancas; borde preoccipital en forma de una fuerte lámina (Colletidae, Colletinae, parte) (poco común, tropical hasta Arizona) ..... *Eulonchopria* [2]

— Cuerpo con puntos no especialmente fuertes; tegumento del metasoma sin bandas; borde preoccipital no laminado 124

124(123). Tercera celda submarginal más larga que la segunda [Fig. 237]; clípeo del macho y comúnmente de la hembra con amarillo; escopa de la hembra primariamente en la tibia [como en Fig. 345] (Andrenidae, Panurginae, parte) ..... *Protandrena* [18]

— Tercera celda submarginal más corta que la segunda [como en Fig. 238]; cara sin marcas amarillas (excepto cuando la cabeza es muy amarilla); escopa de la hembra primariamente en el fémur [como en Fig. 344] (Colletidae, Diphaglossinae, parte) (raro, tropical) .... *Mydrosoma* (parte) [6]

125(122). Placa pigidial ausente o modificada de modo que no se la reconoce en ninguno de ambos sexos; placa basitibial

scopa absent; metasomal vestiture includes patches of appressed plumose hairs [Fig. 491] (Anthophoridae, Anthophorinae, Protepeolini) (rare, SW) .... *Leiopodus* [130]

— Pygidial plate distinct in females and most males [Fig. 235]; basitibial plate distinct in females and most males; scopa present on hind tibia and basitarsus; patches of appressed pubescence absent on metasomal terga although hair bands commonly present 126

126(125). Stigma three or more times as long as prestigma [Fig. 241], except in some *Exomalopsis* in which apical part of marginal cell is bent abruptly away from wing margin [Fig. 241] (Anthophoridae, Anthophorinae, Exomalopsini, part) 127

— Stigma less than three times as long as prestigma [Fig. 240]; apical part of marginal cell gradually bent away from wing margin [Fig. 240] 129

127(126). Mandible simple [Fig. 242]; body with abundant pale pubescence, often forming metasomal bands or covering much of metasoma..... ..... *Exomalopsis* (part) [120]

— Mandible with preapical tooth on upper margin [Fig. 243]; body without areas or bands of pale pubescence..... 128

128(127). Fore basitarsus with comb on inner margin (next to strigilis) [Fig. 244]; female with thoracic venter and leg bases covered with hooked bristles (rare, tropical) ..... *Monoeca* [121]

ausente; escopa ausente; pubescencia del metasoma incluyendo áreas de pelos plumosos aplastados [Fig. 491] (Anthophoridae, Anthophorinae, Protepeolini) (raro, SW) ... . *Leiopodus* [130]

— Placa pigidial conspicua en hembras y mayor parte de los machos [Fig. 235]; placa basitibial conspicua en hembras y mayor parte de los machos; escopa presente en la tibia y basitarso posteriores; áreas de pubescencia aplastada ausentes en los tergos metasomales, aunque bandas de pelos son comunes 126

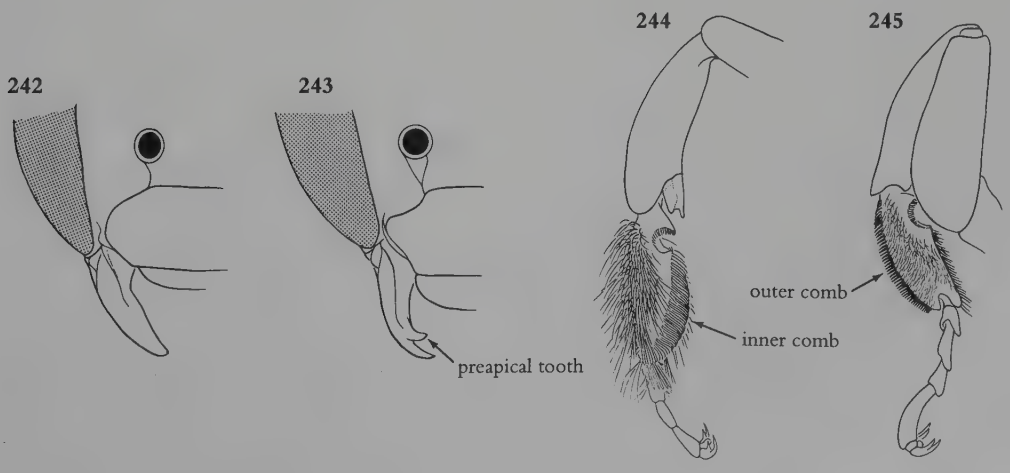
126(125). Estigma tres o más veces tan largo como el prestigma [Fig. 241], excepto algunos *Exomalopsis* en los cuales la parte apical de la celda marginal está abruptamente doblada, alejándose del margen alar [Fig. 241] (Anthophoridae, Anthophorinae, Exomalopsini, parte) 127

— Estigma menos de tres veces tan largo como el prestigma [Fig. 240]; parte apical de la celda marginal alejándose en curva suave del margen alar [Fig. 240]..... 129

127(126). Mandíbula simple [Fig. 242]; cuerpo con abundante pubescencia clara, frecuentemente formando bandas metasomales o cubriendo la mayor parte del metasoma ... . *Exomalopsis* (parte) [120]

— Mandíbula con diente preapical en el margen superior [Fig. 243]; cuerpo sin bandas o áreas de pubescencia clara 128

128(127). Basitarso anterior con peine en el margen interno (próximo al estrígilo) [Fig. 244]; hembra con setas ganchudas en el vientre del tórax y base de las patas (raro, tropical) ..... *Monoeca* [121]



— Fore basitarsus with comb on outer margin (opposite side from strigilis) [Fig. 245]; thoracic venter and leg bases without hooked bristles (tropical) .... *Paratetrapedia* (part) [122]

129(126). Second abscissa of vein M+Cu of hind wing less than two-thirds (often only half) as long as M and less than 1.6 times as long as cu-v (often little longer than cu-v) [Fig. 246]; vertex of head convex seen from front [Fig. 249] (Anthophoridae, Anthophorinae, Emphorini, part) 130

— Second abscissa of M+Cu of hind wing more than two-thirds as long as M and over 1.6 times as long as cu-v [Figs. 247 and 248]; vertex not continuously convex seen from front or, if generally convex, then flat or slightly concave between summit of eye and lateral ocellus [Fig. 250] 131

— Basitarso anterior con peine en el margen externo (lado opuesto al estrígilo) [Fig. 245]; tórax y patas sin setas ganchudas (tropical) ..... *Paratetrapedia* (parte) [122]

129(126). Ala posterior con segunda abscisa de la vena M+Cu menos de dos tercios (frecuentemente sólo la mitad) del largo de M y menos de 1,6 veces del largo de cu-v (frecuentemente poco más larga que cu-v) [Fig. 246]; cabeza con vértice convexo visto de frente [Fig. 249] (Anthophoridae, Anthophorinae, Emphorini, parte) 130

— Ala posterior con segunda abscisa de M+Cu más de dos tercios del largo de M y más de 1,6 veces del largo de cu-v [Figs. 247 y 248]; cabeza con vértice no contínuamente convexo o, si convexo en general, entonces plano o débilmente cóncavo entre el ápice del ojo y el ocelo lateral [Fig. 250] 131

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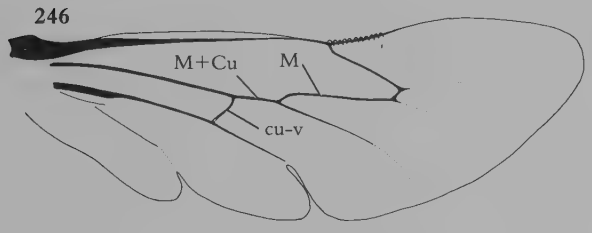

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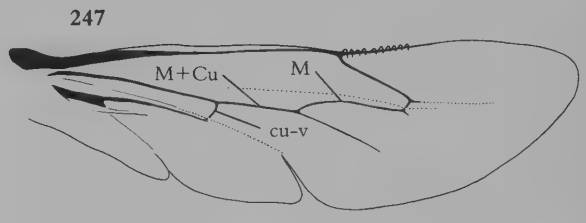

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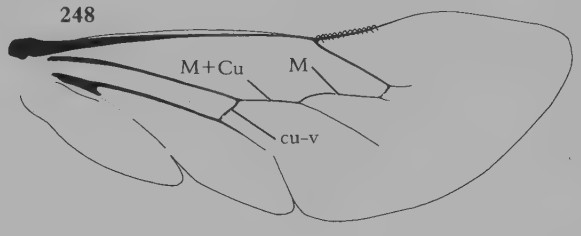


130(129). Proboscis in repose reaching base of metasoma ..... *Melitoma* [92]

— Proboscis in repose usually not reaching behind anterior coxae, not reaching base of metasoma (mostly W) ..... *Diadasia* [91]

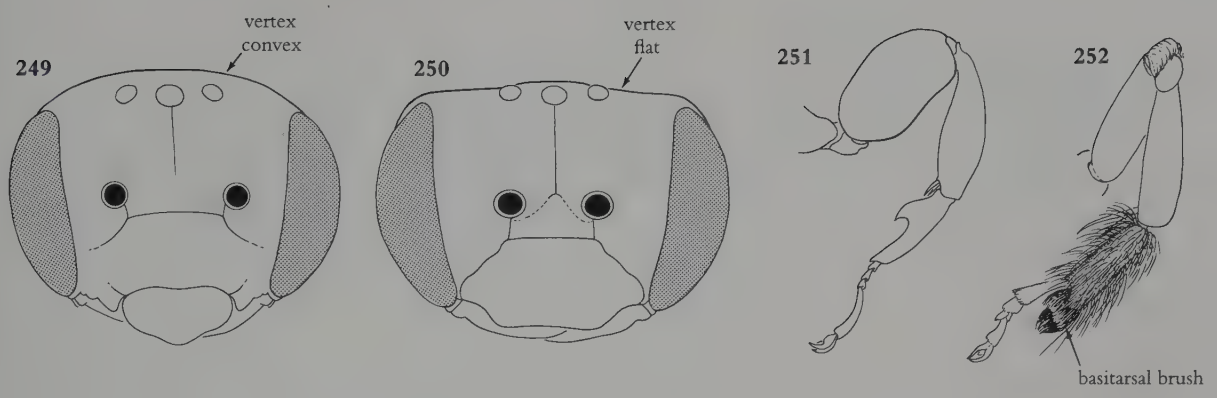
131(129). Hind wing with second abscissa of M+Cu three times as long as cu-v [Fig. 247]; hind leg of male greatly enlarged [Fig. 251]; hind basitarsus of female without apical brush; antenna of male similar to that of female (Anthophoridae, Anthophorinae, Exomalopsini, part) (uncommon) .... *Ancyloscelis* [119]

130(129). Proboscis en reposo alcanza la base del metasoma .... *Melitoma* [92]

— Proboscis en reposo usualmente no sobrepasa la coxa anterior (principalmente W) ..... *Diadasia* [91]

131(129). Ala posterior con segunda abscisa de M+Cu tres veces más larga que cu-v [Fig. 247]; macho con pata posterior muy engrosada [Fig. 251]; basitarso posterior de la hembra sin cepillo apical; macho y hembra con antena similar (Anthophoridae, Anthophorinae, Exomalopsini, parte) (poco común) ..... *Ancyloscelis* [119]

— Ala posterior con segunda abscisa de M+Cu usualmente



— Hind wing with second abscissa of M+Cu usually not over twice (rarely about three times) as long as cu-v [Fig. 248]; hind leg of male not enlarged; hind basitarsus of female with broad, dense brush extending beyond base of second tarsal segment [Fig. 252]; antenna of male usually greatly elongated [Fig. 481] (Anthophoridae, Anthophorinae, Eucerini) 132

132(131). Females 133

— Males 153

133(132). Gradulus of S2 weakly biconvex [Fig. 253]; mandible with condylar ridge expanded forward, at least as salient as and usually more salient than outer ridge [Fig. 255]; gradulus of T6 without lateral parts; labrum two-thirds as long as broad or longer (tropical) ..... *Thygater* [117]

— Gradulus of S2 strongly biconvex, forming angle of 140° or less between two convexities [Fig. 254]; mandible normal, with condylar ridge less salient than outer ridge [Fig. 256]; gradulus of T6 usually

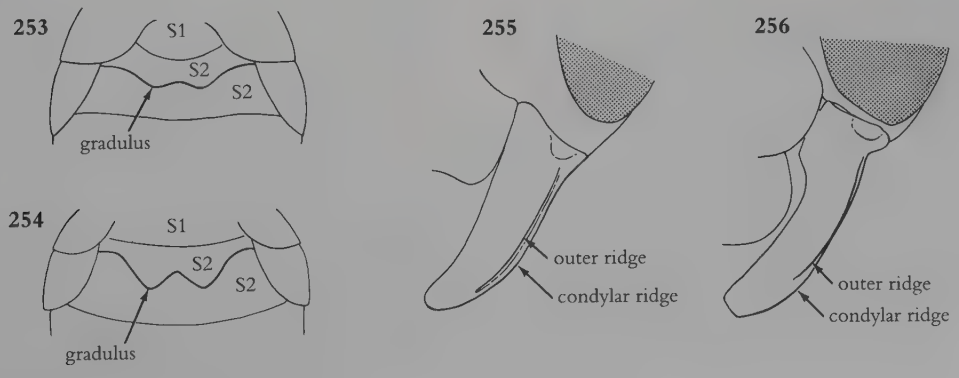
no más de dos veces (raramente casi tres veces) larga que cu-v [Fig. 248]; pata posterior del macho no engrosada; basitarso posterior de la hembra con cepillo ancho, denso, extendiéndose más allá de la base del segundo segmento tarsal [Fig. 252]; antena del macho usualmente muy alargada [Fig. 481] (Anthophoridae, Anthophorinae, Eucerini) 132

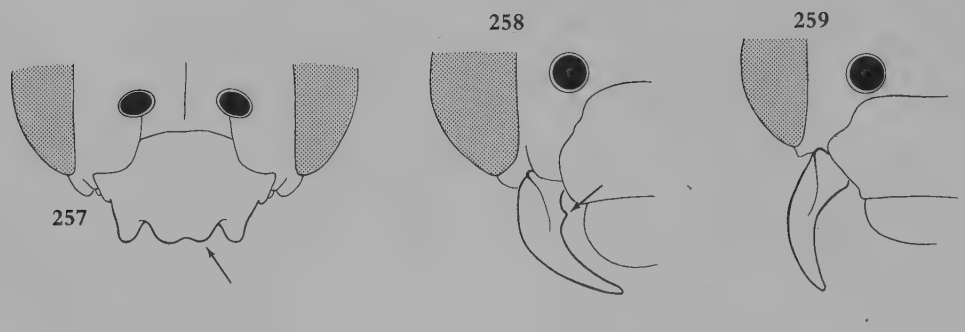
132(131). Hembras 133

— Machos 153

133(132). S2 con grádulo débilmente biconvexo [Fig. 253]; mandíbula con borde condilar expandido hacia adelante, al menos tan saliente, y usualmente más saliente, que el borde externo [Fig. 255]; grádulo de T6 sin sectores laterales; labro dos tercios tan largo como ancho, o más largo (tropical) ..... *Thygater* [117]

— S2 con grádulo fuertemente biconvexo, ambas convexidades formando ángulo de 140° o menos [Fig. 254]; mandíbula normal, con borde condilar menos saliente que el borde externo [Fig. 256]; grádulo de T6 usualmente con





with lateral parts; labrum usually less than two-thirds as long as broad 134

134(133). Apical clypeal margin trilobed, with median lobe short, broad, and often slightly emarginate [Fig. 257] (rare, eastern and central U.S.A.)..... ..... *Cemolobus* [102]

— Apical clypeal margin truncate [Figs. 258 and 259] 135

135(134). Inner margin of mandible with tooth near base [Fig. 258] ..... *Xenoglossa* [118]

— Inner margin of mandible without basal tooth [Fig. 259] 136

136(135). Posterior basitarsus with hairs of inner surface sparse except for narrow band of dense hairs near posterior margin [Fig. 260]..... *Peponapis* [111]

— Posterior basitarsus with inner surface uniformly densely hairy [Fig. 261] 137

137(136). Tegula narrowed anteriorly, lateral margin slightly concave or straight in anterior half or less* [Fig. 262]; maxillary palpus usually four-segmented, rarely three- or five-segmented 138

— Tegula not narrowed anteriorly, lateral margin convex [Fig. 263]; maxillary palpus three- to six-segmented 139

138(137). Mandible simple or scarcely notched at apex, widest preapical part less than three-fourths as wide as base [Fig. 264]; last antennal segment much less than twice as long as wide [as in Fig. 266]..... ..... *Melissodes* [108]

*Often hairs must be removed to see this character. In *Melissodes stearnsi* Cockerell, although the tegula is shaped much as in other *Melissodes*, the relevant tegular margin is feebly convex; this species runs to couplet 151 and fails to agree with either alternative.

sectores laterales; labro usualmente menos de dos tercios tan largo como ancho 134

134(133). Margen apical del clípeo trilobado, con lóbulo medio corto, ancho, y frecuentemente algo emarginado [Fig. 257] (raro, este y centro de E.U.A.)..... *Cemolobus* [102]

— Margen apical del clípeo truncado [Figs. 258 y 259] 135

135(134). Margen interno de la mandíbula con diente cerca de la base [Fig. 258]..... *Xenoglossa* [118]

— Margen interno de la mandíbula sin diente basal [Fig. 259] 136

136(135). Basitarso posterior con pelos ralos en la superficie interna, excepto por una banda angosta de pelos densos cerca del margen posterior [Fig. 260] .... *Peponapis* [111]

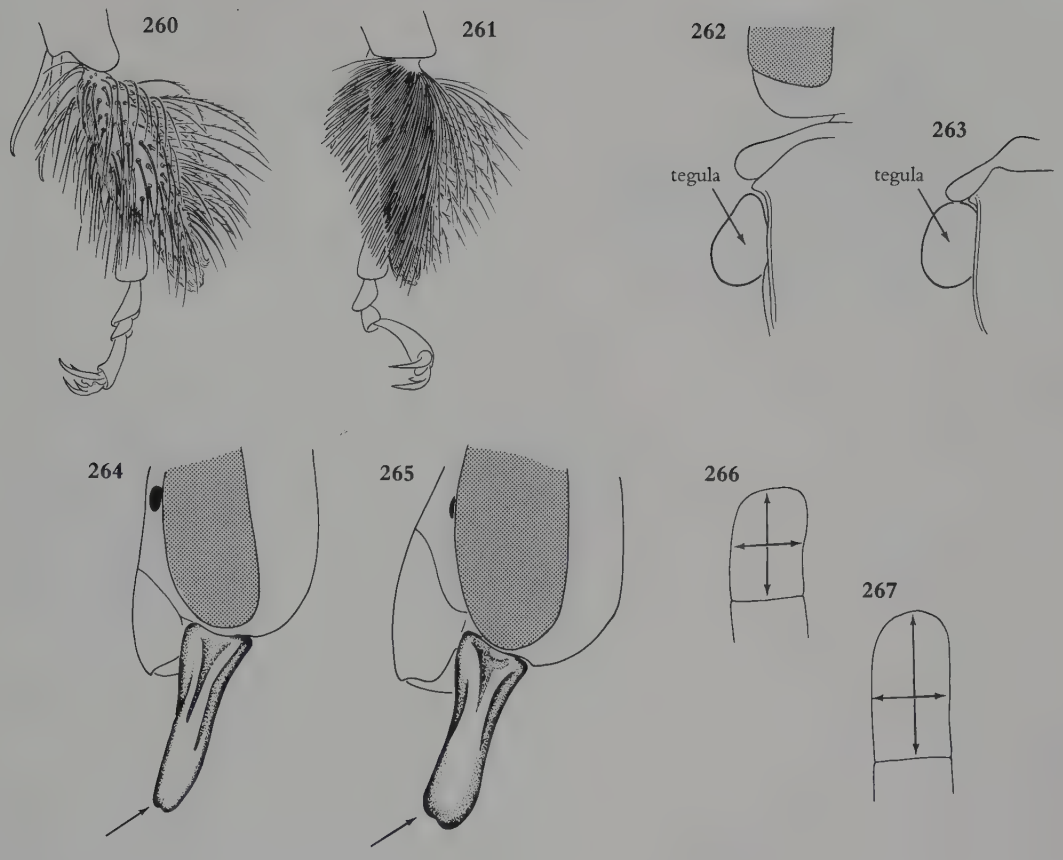
— Basitarso posterior con pelos en la superficie interna uniformemente densos [Fig. 261] 137

137(136). Tégula angostada anteriormente, margen lateral en la mitad o menos de la mitad anterior débilmente cóncavo o recto* [Fig. 262]; palpo maxilar usualmente con cuatro segmentos, raramente con tres o cinco 138

— Tégula no angostada anteriormente, margen lateral convexo [Fig. 263]; palpo maxilar con tres a seis segmentos.. 139

138(137). Mandíbula simple o con débil muesca apical, parte preapical más ancha menos de tres cuartos del ancho de la base [Fig. 264]; último segmento antenal mucho menos de dos veces más largo que ancho [como en Fig. 266]..... ..... *Melissodes* [108]

*Frecuentemente para ver este carácter los pelos deben removerse. En *Melissodes stearnsi* Cockerell, a pesar de que la tégula tiene bastante la forma presente en otros *Melissodes*, el márgen tegular mencionado es débilmente convexo; esta especie va a 151 y no concuerda con ninguna de las dos alternativas.



— Mandible strongly notched and therefore bilobed at apex (but often worn, so that this structure is lost), expanded apically so that preapical part is nearly as wide as base [Fig. 265]; last antennal segment about twice as long as broad [Fig. 267] (rare, SW) .... *Martinapis* [107]

139(137). Scopal hairs simple or with minute barbs .. 140

— Scopal hairs with branches 146

140(139). Clypeus with hairs short, erect, robust especially basally, bristle-like, and apically hooked or wavy [Fig. 268] (rare, Mexico) ..... *Pectinapis* [110]

— Clypeal hairs slender, not hooked, not bristle-like 141

141(140). Pale pubescent bands of metasomal terga with abundant, basally plumose, apically spatulate hairs [as in Fig. 269]; maxillary palpus four-segmented (rare) ..... *Anthedonia* [101]

— Pale pubescent bands of metasomal terga without

— Mandíbula con fuerte muesca apical y por lo tanto con ápice bilobado (pero frecuentemente gastado, de modo que esta estructura se pierde), con ápice expandido de modo que la parte preapical es casi tan ancha como la base [Fig. 265]; último segmento antenal casi dos veces el ancho [Fig. 267] (raro, SW) ..... *Martinapis* [107]

139(137). Pelos de la escopa simples o con barbas diminutas..... 140

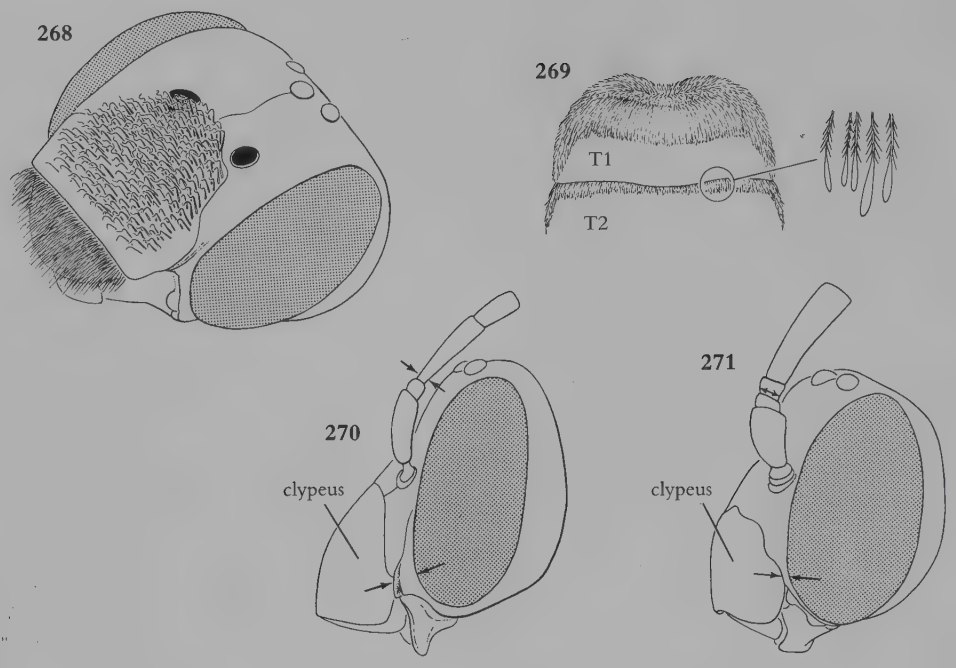
— Pelos de la escopa ramosos 146

140(139). Clípeo con pelos cortos, erectos, en la base especialmente robustos, setosos, y con ápice ondulado o ganchudo [Fig. 268] (raro, México) ..... *Pectinapis* [110]

— Clípeo con pelos finos, no setosos ni ganchudos 141

141(140). Bandas pubescentes claras de los tergos metasomales con abundantes pelos de base plumosa y de ápice espatulado [como en Fig. 269]; palpo maxilar con cuatro segmentos (raro) ..... *Anthedonia* [101]

— Bandas pubescentes claras de los tergos metasomales sin



spatulate hairs; maxillary palpus five- or six-segmented, rarely four-segmented 142

142(141). Minimum oculoclypeal distance much greater than minimum width of first flagellar segment [Fig. 270]; clypeus strongly protuberant [Fig. 270]; stipes with long, dense, coarse, apically hooked or wavy hairs (Mexico) ..... *Loxoptilus* [106]

— Minimum oculoclypeal distance not greater than minimum width of first flagellar segment [Fig. 271]; clypeus variable; stipes without area of hooked hairs 143

143(142). Postpalpal part of galea longer than eye [Fig. 300]; clypeus protuberant [slightly less so than in male, Fig. 302] 144

— Postpalpal part of galea not longer than eye; clypeus flat to slightly protuberant [slightly less so than in male, Fig. 301] 145

144(143). Middle ocellus not as broad as flagellar width or in *S. venusta* (Cresson) as wide as flagellum; maxillary palpus six-segmented; pygidial plate rather broad, rounded apically, apicolateral margin convex [Fig. 272] (except in *S. venusta* and others) ..... *Synhalonia* [114]

— Middle ocellus broader than flagellum; maxillary palpus five-segmented; pygidial plate tapering and

pelos espatulados; palpo maxilar con cinco o seis segmentos, raramente con cuatro 142

142(141). Distancia mínima clípeo-ocular mucho mayor que el ancho mínimo del primer flagelómero [Fig. 270]; clípeo fuertemente protuberante [Fig. 270]; estipe con pelos largos, densos, fuertes, y en el ápice ganchudos u ondulados (México) ..... *Loxoptilus* [106]

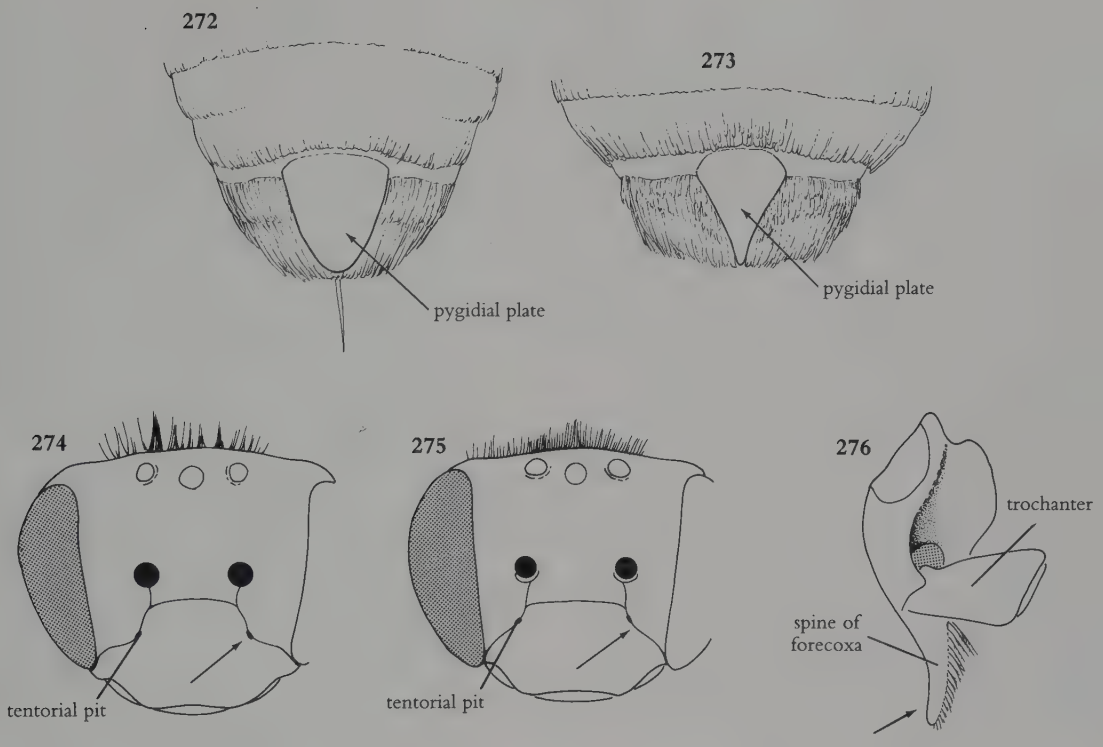
— Distancia mínima clípeo-ocular no mayor que el ancho mínimo del primer flagelómero [Fig. 271]; clípeo variable; estipe sin área de pelos ganchudos 143

143(142). Gálea con parte apical al palpo más larga que el ojo [Fig. 300]; clípeo un poco protuberante [algo menos que en el macho, Fig. 302] 144

— Gálea con parte apical al palpo no más larga que el ojo; clípeo plano o débilmente protuberante [algo menos que en el macho, Fig. 301] 145

144(143). Ocelo medio no tan ancho como el flagelo, o en *S. venusta* (Cresson) tan ancho como el flagelo; palpo maxilar con seis segmentos; placa pigidial más bien ancha, con ápice redondeado y margen apical lateral convexo [Fig. 272] (excepto en *S. venusta* y otros) ..... *Synhalonia* [114]

— Ocelo medio más ancho que el flagelo; palpo maxilar con cinco segmentos; placa pigidial ahusada, con punta roma



bluntly pointed apically, apicolateral margin concave [Fig. 273] (rare, SW) ..... *Simanthedon* [112]

145(143). Scopal hairs with minute barbs; clypeus with margin indented at anterior tentorial pit to form almost right angular notch [Fig. 274] (tropical to Arizona) ..... *Gaesischia* (part) [104]

— Scopal hairs simple; clypeus with margin at level of anterior tentorial pits straight or slightly concave [Fig. 275] ..... *Tetraloniella* (part) [116]

146(139). Forecoxa with inner apical hairy spine [Fig. 276] (tropical to Arizona) ..... *Gaesischia* (part) [104]

— Forecoxa without spine 147

147(146). Vertex strongly elevated, median ocellus below summit in facial view [Fig. 277]; gradulus of T6 with lateral parts cariniform; hairs of upper and outer parts of scopa with abundant, uniform, short branches, mostly with 10 or more branches on each side of rachis and often with as many as 15; apical part of rachis extending beyond last branch usually shorter than average length of branches (SW) .... *Syntrichalonia* [115]

— Vertex weakly elevated if at all, median ocellus near

y margen apical lateral cóncavo [Fig. 273] (raro, SW) .... *Simanthedon* [112]

145(143). Pelos de la escopa con barbas diminutas; margen del clípeo junto a la tentorina anterior formando una muesca en ángulo casi recto [Fig. 274] (tropical hasta Arizona) .... *Gaesischia* (parte) [104]

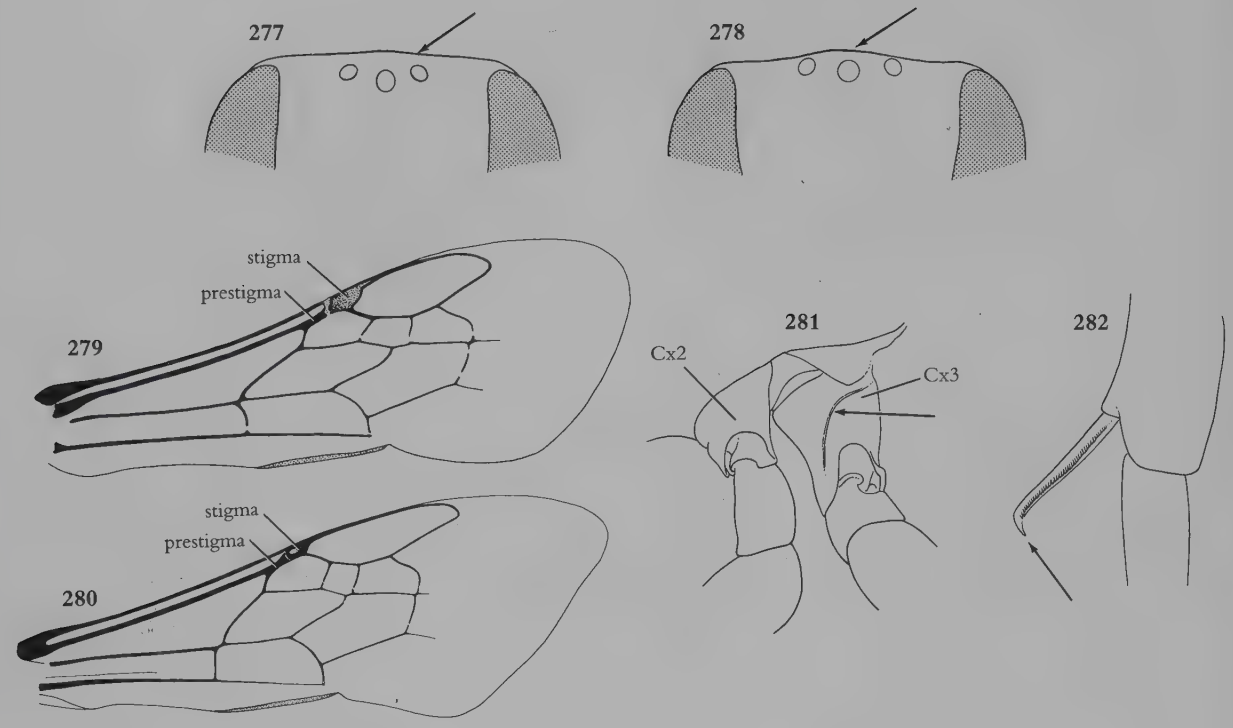
— Pelos de la escopa simples; margen del clípeo a nivel de la tentorina anterior recto o débilmente cóncavo [Fig. 275] ..... *Tetraloniella* (parte) [116]

146(139). Coxa anterior con espina apical interna pilosa [Fig. 276] (tropical hasta Arizona) .... *Gaesischia* (parte) [104]

— Coxa anterior sin espina 147

147(146). Vértice fuertemente elevado, en vista frontal ocelo medio debajo del extremo superior de la cabeza [Fig. 277]; grádulo de T6 con sectores laterales careniformes; pelos de la región superior y externa de la escopa con ramas cortas, uniformes, y abundantes, en general con 10 o más ramas a cada lado del raquis, frecuentemente con tantos como 15; raquis más allá de la última rama extendiéndose por una distancia usualmente más corta que el largo medio de las ramas (SW) ..... *Syntrichalonia* [115]

— Vértice poco o nada elevado, en vista frontal ocelo medio



or on summit in facial view [Fig. 278]; gradulus of T6 with lateral parts cariniform or lamellate; scopal hairs mostly with 6 to 8 branches on each side of rachis, rarely with as many as 10; apical part of rachis long, extending beyond last branch by at least average length of branches..... 148

148(147). Tibial spurs weak, on middle leg less than half as long as tibia measured from base of spur to anterior tibiofemoral articulation; lateral arm of hypostomal carina prominent, sublamelliform; T2 and T3 with short, dense, white pubescence in broad basal bands, with short, relatively simple, dark, appressed hairs from basal bands almost to apices of terga (very rare, Baja California, California)..... ..... *Agapanthinus* [100]

— Tibial spurs strong, middle spur more than half as long as tibia; lateral arm of hypostomal carina weak, cariniform; T3 and usually T2 without basal pale pubescent bands or with distal pale band in addition, or entirely covered by pale pubescence 149

149(148). Prestigma shorter than stigma [Fig. 279]; lateral hind coxal carina sharp, bent strongly posteriad bas-

proximo o en el extremo superior de la cabeza [Fig. 278]; grádulo de T6 con sectores laterales careniformes o laminados; pelos de la escopa en general con seis a ocho ramas a cada lado del raquis, raramente con tantos como 10; raquis más allá de la última rama largo, extediéndose por una distancia al menos igual al largo medio de las ramas.. 148

148(147). Espolones tibiales débiles, el de la tibia media menos de la mitad del largo de la tibia, medida desde la base del espolón a la articulación tibiofemoral anterior; carena hipostomal con rama lateral prominente, sublaminiforme; T2 y T3 con pubescencia blanca, corta, y densa, formando bandas basales anchas, desde éstas hasta casi los ápices tergales con pelos oscuros, cortos, aplastados, y relativamente simples (muy raro, Baja California, California) ..... *Agapanthinus* [100]

— Espolones tibiales largos, espolón medio más de la mitad del largo de la tibia; carena hipostomal con rama lateral débil, careniforme; T3 y usualmente T2 sin banda basal de pubescencia clara o además con banda clara distal, o enteramente cubiertos por pubescencia clara 149

149(148). Prestigma más corto que el estigma [Fig. 279]; coxa posterior con carena lateral filosa, basalmente doblada

ally to form a rounded angle of almost 90° [Fig. 281]; maxillary palpus two- or three-segmented (tropical to Texas) ..... *Melissoptila* [109]

— Prestigma as long as or longer than stigma [Fig. 280]; lateral hind coxal carina absent or reduced to short apical portion, straight or only slightly curved toward rear; maxillary palpus four- to six-segmented 150

150(149). Middle tibial spur hooked near tip [Fig. 282]; lateral arms of gradulus of T6 short, cariniform; maxillary palpus four-segmented (rare, SW) .... *Idiomelissodes* [105]

— Middle tibial spur straight or slightly curved; lateral arms of gradulus of T6 variable; maxillary palpus four- to six-segmented 151

151(150). Maxillary palpus usually four-segmented; if maxillary palpus five-segmented, then basal pubescent band of T2 with at least a few spatuloplumose hairs [Fig. 269]; lateral arms of gradulus of T6 lamelliform, often with a small tooth ..... *Svastra* [113]

— Maxillary palpus five- or six-segmented; basal pubescent band of T2 without spatuloplumose hairs; lateral arms of gradulus of T6 cariniform to lamelliform 152

152(151). Basitibial plate with margin entirely exposed, surface often bare [Fig. 283]; T6 with lateral parts of gradulus lamelliform and ending in strong tooth (hairs of maxilla and mentum hooked except in the Central American *Florilegus isthmicus* Michener) .... *Florilegus* [103]

hacia adentro formando un ángulo redondeado de casi 90° [Fig. 281]; palpo maxilar con dos o tres segmentos (tropical hasta Texas) ..... *Melissoptila* [109]

— Prestigma tan largo o más largo que el estigma [Fig. 280]; coxa posterior con carena lateral ausente o reducida a un corto tramo apical, recto o sólo débilmente curvado hacia adentro; palpo maxilar con cuatro a seis segmentos .. 150

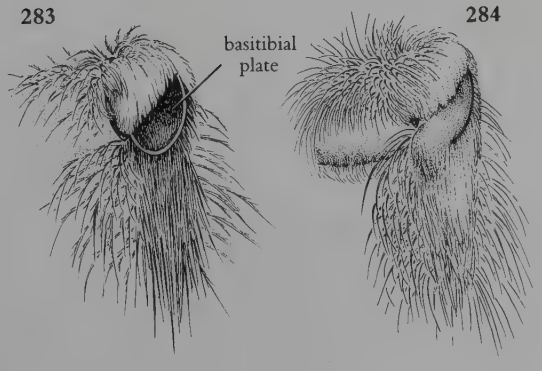
150(149). Espolón tibial medio encorvado cerca del ápice [Fig. 282]; grádulo de T6 con sectores laterales cortos, careniformes; palpo maxilar con cuatro segmentos (raro, SW) .. .. *Idiomelissodes* [105]

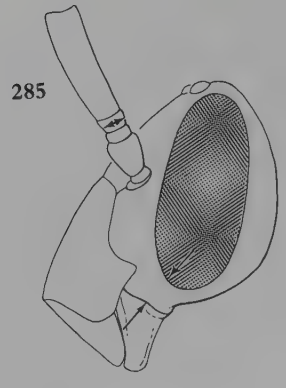
— Espolón tibial medio recto o levemente curvo; grádulo de T6 con sectores laterales variables; palpo maxilar con cuatro a seis segmentos 151

151(150). Palpo maxilar usualmente con cuatro segmentos; si con cinco segmentos, entonces banda pubescente basal de T2 con al menos unos pocos pelos espátulo-plumosos [Fig. 269]; grádulo de T6 con sectores laterales laminiformes, frecuentemente con un pequeño diente .... *Svastra* [113]

— Palpo maxilar con cinco o seis segmentos; banda pubescente basal de T2 sin pelos espátulo-plumosos; grádulo de T6 con sectores laterales careniformes a laminiformes 152

152(151). Placa basitibial con margen enteramente expuesto y superficie frecuentemente glabra [Fig. 283]; grádulo de T6 con sectores laterales laminiformes y terminando en fuerte diente (mentum y maxila con pelos ganchudos, excepto una especie de América Central, *Florilegus isthmicus* Michener) ..... *Florilegus* [103]





— Basitibial plate with anterior and apical part of margin hidden, surface usually hairy [Fig. 284]; T6 with lateral parts of gradulus cariniform, never toothed if sublamelliform ..... *Tetraloniella* (part) [116]

153(132). Minimum length of malar area greater than minimum width of first flagellar segment [Fig. 285]; pygidial plate unrecognizable or indicated by weak lateral carinae, mostly covered by long, appressed hairs, T7 bidentate apically; lower part of paraocular carina absent; labrum at least three-fourths as long as broad (tropical)..... *Thygater* [117]

— Minimum length of malar area equal to or less than minimum width of first flagellar segment [Figs. 301 and 302]; pygidial plate prominent, exposed, with short hairs or bare, truncate or rounded apically, often notched laterally near apex; lower part of paraocular carina present; labrum variable but usually less than three-fourths as long as broad..... 154

154(153). Clypeal margin trilobed, median lobe broad and often shallowly emarginate medially [Fig. 286]; first flagellar segment as long as second segment; S6 with large, laterally directed, lateral tooth (rare, eastern and central U.S.A.) ..... *Cemolobus* [102]

— Clypeal margin truncate; first flagellar segment usually shorter than second segment; S6 usually without lateral teeth..... 155

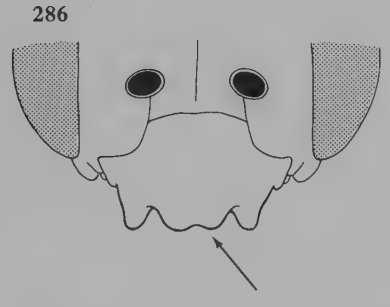
— Placa basitibial con margen oculto anterior y apicalmente, superficie usualmente pilosa [Fig. 284]; grádulo de T6 con sectores laterales careniformes, nunca con diente si sublaminiformes..... *Tetraloniella* (parte) [116]

153(132). Largo mínimo del espacio malar mayor que el ancho mínimo del primer flagelómero [Fig. 285]; placa pigidial irreconocible o indicada por una débil carena lateral, mayormente cubierta por largos pelos aplastados, T7 bidentado apicalmente; sector inferior de la carena paraocular ausente; labro al menos tres cuartos tan largo como ancho (tropical)..... *Thygater* [117]

— Largo mínimo del espacio malar igual o menor que el ancho mínimo del primer flagelómero [Figs. 301 y 302]; placa pigidial prominente, expuesta, con pelos cortos o glabra, trunca o redondeada, a veces con muesca lateral cerca del ápice; sector inferior de la carena paraocular presente; labro variable, pero usualmente menos de tres cuartos tan largo como ancho 154

154(153). Margen del clípeo trilobado, lóbulo medio ancho y frecuentemente algo emarginado al medio [Fig. 286]; primer flagelómero tan largo como el segundo; S6 con diente lateral grande, dirigido lateralmente (raro, este y centro de E.U.A.)..... *Cemolobus* [102]

— Margen del clípeo truncado; primer flagelómero usualmente más corto que el segundo; S6 usualmente sin diente lateral 155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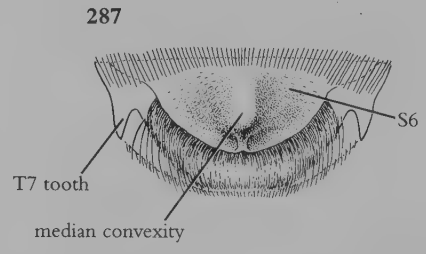

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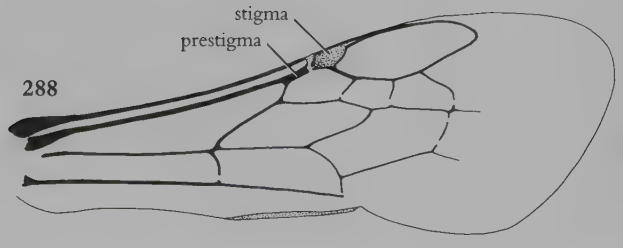

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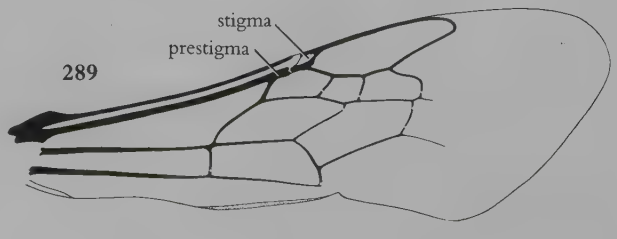


289

155(154). T7 with lateral gradular tooth or strong angle on each side of pygidial plate [Fig. 287] (sometimes hidden in dense hair or by T6) 156

— T7 without lateral teeth (occasionally S6 with lateral teeth that can be seen from above and may be confused with tergal teeth) 159

156(155). Stigma slightly longer than prestigma [Fig. 288]; maxillary palpus two- or three-segmented; lateral hind coxal carina prominent, curved [Fig. 281] (tropical to Texas) ..... *Melissoptila* [109]

— Stigma small, usually as short as or shorter than prestigma [Fig. 289]; maxillary palpus usually four- or five-segmented, rarely three-segmented; lateral hind coxal carina reduced or absent 157

157(156). S6 with a prominent median convexity [Fig. 287]; fore femur broadest about one-fourth or one-third of its length from apex; maxillary palpus five-segmented ..... *Florilegus* [103]

— S6 flat or with an exceedingly shallow, longitudinal median depression; fore femur broadest basal to middle; maxillary palpus usually three- or four-segmented, rarely five-segmented 158

158(157). Tegula narrowed anteriorly, lateral margin slightly concave or straight in anterior half or third (often hidden by hairs) [Fig. 290]; clypeus little or moderately protruding (extending in front of eye by eye width or less in lateral view) ..... *Melissodes* [108]

— Tegula not narrowed anteriorly, with lateral margin convex [as in Fig. 291]; clypeus strongly protuberant (extending in front of eye by more than eye width in lateral view [as in Fig. 302]) ..... *Peponapis* (part) [111]

159(155). First flagellar segment more than 1.5 times as long as second [Fig. 292]; inner margin of mandible with tooth near base [Fig. 258] ..... *Xenoglossa* [118]

— First flagellar segment no longer than second segment [Fig. 293] and often much shorter [Fig. 295]; inner margin of mandible without a tooth near base [Fig. 259] 160

160(159). Clypeus strongly protuberant, abruptly beveled and snoutlike apically, profile forming distinct pre-

155(154). Grádulo de T7 a cada lado de la placa pigidial con un diente o ángulo fuerte [Fig. 287] (a veces oculto por pelos densos o por T6) 156

— T7 sin dientes laterales (a veces S6 con dientes laterales que pueden verse desde arriba y confundirse con dientes tergales) 159

156(155). Estigma un poco más largo que el prestigma [Fig. 288]; palpo maxilar con dos o tres segmentos; coxa posterior con carena lateral prominente, curva [Fig. 281] (tropical hasta Texas) ..... *Melissoptila* [109]

— Estigma pequeño, usualmente igual o más corto que el prestigma [Fig. 289]; palpo maxilar usualmente con cuatro o cinco segmentos, rara vez con tres; coxa posterior con carena lateral reducida o ausente 157

157(156). S6 con elevación media prominente [Fig. 287]; ancho máximo del fémur anterior cerca de su tercio o cuarto apical; palpo maxilar con cinco segmentos ..... *Florilegus* [103]

— S6 plano o con depresión longitudinal media muy poco profunda; fémur anterior con ancho máximo entre la base y la mitad; palpo maxilar usualmente con tres o cuatro segmentos, rara vez con cinco 158

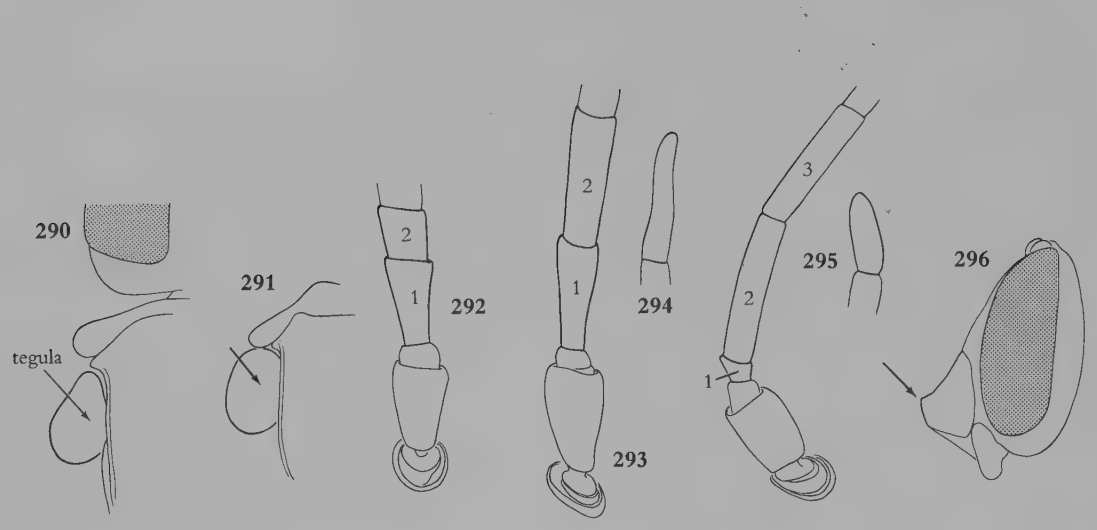
158(157). Tégula angostada anteriormente, margen lateral en la mitad o tercio anterior débilmente cóncavo o recto (frecuentemente cubierto por pelos) [Fig. 290]; clípeo poco o moderadamente protuberante (en vista lateral extendiéndose por delante del ojo por una distancia igual o menor al ancho ocular) ..... *Melissodes* [108]

— Tégula no angostada anteriormente, con margen lateral convexo [como en Fig. 291]; clípeo fuertemente protuberante (en vista lateral extendiéndose por delante del ojo por más del ancho ocular [como en Fig. 302]) ..... *Peponapis* (parte) [111]

159(155). Primer flagelómero más de una vez y media más largo que el segundo [Fig. 292]; margen interno de la mandíbula con diente cerca de la base [Fig. 258] ..... *Xenoglossa* [118]

— Primer flagelómero no más largo que el segundo [Fig. 293] y frecuentemente mucho más corto [Fig. 295]; margen interno de la mandíbula sin diente cerca de la base [Fig. 259] 160

160(159). Clípeo fuertemente protuberante, abruptamente biselado apicalmente, de perfil con ángulo preapical con-



apical angle and concave above angle [Fig. 296] (rare, SW) ..... *Simanthedon* [112]

— Clypeus uniformly convex or straight in profile [Figs. 301 and 303] 161

161(160). Tibial spurs weak, middle tibial spur about or less than half as long as tibia measured from base of spur to anterior tibiofemoral articulation 162

— Tibial spurs strong, middle tibial spur longer than half of length of tibia 165

162(161). First flagellar segment only slightly shorter than second [Fig. 293]; last flagellar segment tapering to apex [Fig. 294]; flagellum bright yellow (rare, SW) ..... *Martinapis* [107]

— First flagellar segment half as long as second or less [Fig. 295]; last flagellar segment not tapering [Fig. 295]; flagellum tan to black 163

163(162). Last flagellar segment with short, pointed, hooked apex twisted slightly laterad (very rare, Baja California, California) ..... *Agapanthinus* [100]

— Last flagellar segment with a rounded apex [Fig. 295] 164

164(163). Hind basitarsus flattened, shining, largely hairless on outer surface; distal two flagellar segments often slightly compressed (tropical to Arizona) ..... *Gaesischia* [104]

— Hind basitarsus normal, hairy; distal two flagellar segments not compressed (mostly W and Mexico) ..... *Tetraloniella* (part) [116]

165(161). Maximum length of first flagellar segment as great as or slightly greater than minimum length of

spicuo y cóncavo arriba de ese ángulo, a modo de hocico [Fig. 296] (raro, SW) ..... *Simanthedon* [112]

— Clípeo de perfil uniformemente convexo o recto [Figs. 301 y 303] 161

161(160). Espolones tibiales débiles, espolón medio menor o aproximadamente la mitad del largo de la tibia, medida de la base del espolón a la articulación tibiofemoral..... 162

— Espolones tibiales fuertes, espolón medio más largo que la mitad de la tibia 165

162(161). Primer flagelómero sólo poco más corto que el segundo [Fig. 293]; último flagelómero angostándose apicalmente [Fig. 294]; flagelo amarillo brillante (raro, SW) ..... *Martinapis* [107]

— Primer flagelómero la mitad del largo del segundo o menos [Fig. 295]; último flagelómero no angostándose apicalmente [Fig. 295]; flagelo tostado a negro..... 163

163(162). Ultimo flagelómero con un corto ápice aguzado, ganchudo, algo torcido lateralmente (muy raro, Baja California, California) ..... *Agapanthinus* [100]

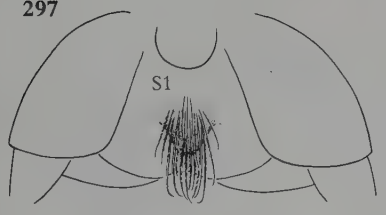
— Ultimo flagelómero con ápice redondeado [Fig. 295]..... 164

164(163). Basitarso posterior aplanado, brillante, y con superficie externa mayormente glabra; los dos flagelómeros distales frecuentemente algo comprimidos (tropical hasta Arizona)..... *Gaesischia* [104]

— Basitarso posterior normal, piloso; los dos flagelómeros distales no comprimidos (mayormente W y México) ..... *Tetraloniella* (parte) [116]

165(161). Largo máximo del primer flagelómero igual o escasamente mayor que el largo mínimo del segundo; último

297



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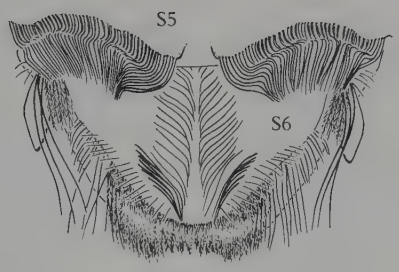

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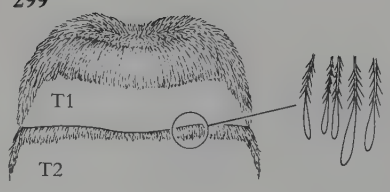


second segment; last flagellar segment at least twice as long as broad [as in Fig. 294] 166

— Maximum length of first flagellar segment usually much less than length of second segment [Fig. 295] or, if about the same, then last flagellar segment less than twice as long as broad and rounded apically 167

166(165). S1 with prominent median convexity directed posteriorly and with a small, deep impression on either side near apex [Fig. 297]; last flagellar segment rounded apically (uncommon, SW) .... *Syntrichalonia* [115]

— S1 relatively flat without a prominent median eminence; last flagellar segment tapering and acuminate apically (rare) ..... *Anthedonia* [101]

167(165). Fore tibial spur as long as basitarsus or slightly longer; posterior margin of S5 with shallow lateral emarginations bordered by long, posteriorly directed, hooked hairs overlying shallow, rounded, bare depressions of S6 [Fig. 298] (rare, SW) .... *Idiomelissodes* [105]

— Fore tibial spur shorter than basitarsus; S5 not emarginate laterally and without long, hooked hairs laterally 168

168(167). Maxillary palpus usually four-segmented; if five-segmented, then T2 with basal pubescent band with at least a few hairs that are basally plumose and apically spatulate [Fig. 299] ..... *Svastra* [113]

— Maxillary palpus five- or six-segmented; T2 never with spatuloplumose hairs 169

169(168). Postpalpal part of galea twice as long as eye or longer [Fig. 300]; clypeus strongly protuberant [Fig. 300]; lower part of paraocular carina prominent; antenna long, reaching pterostigma or beyond in repose (Mexico) ..... *Loxoptilus* [106]

flagelómero al menos dos veces más largo que ancho [como en Fig. 294] 166

— Largo máximo del primer flagelómero usualmente mucho más corto que el segundo [Fig. 295] o, si más o menos del mismo largo, entonces último flagelómero menos de dos veces más ancho que largo y redondeado apicalmente 167

166(165). S1 con eminencia media prominente dirigida hacia atrás y con impresión profunda pequeña a cada lado y cerca del ápice [Fig. 297]; último flagelómero redondeado apicalmente (poco común, SW) ..... *Syntrichalonia* [115]

— S1 relativamente plano, sin prominencia media; último flagelómero angostándose, con ápice acuminado (raro) .... *Anthedonia* [101]

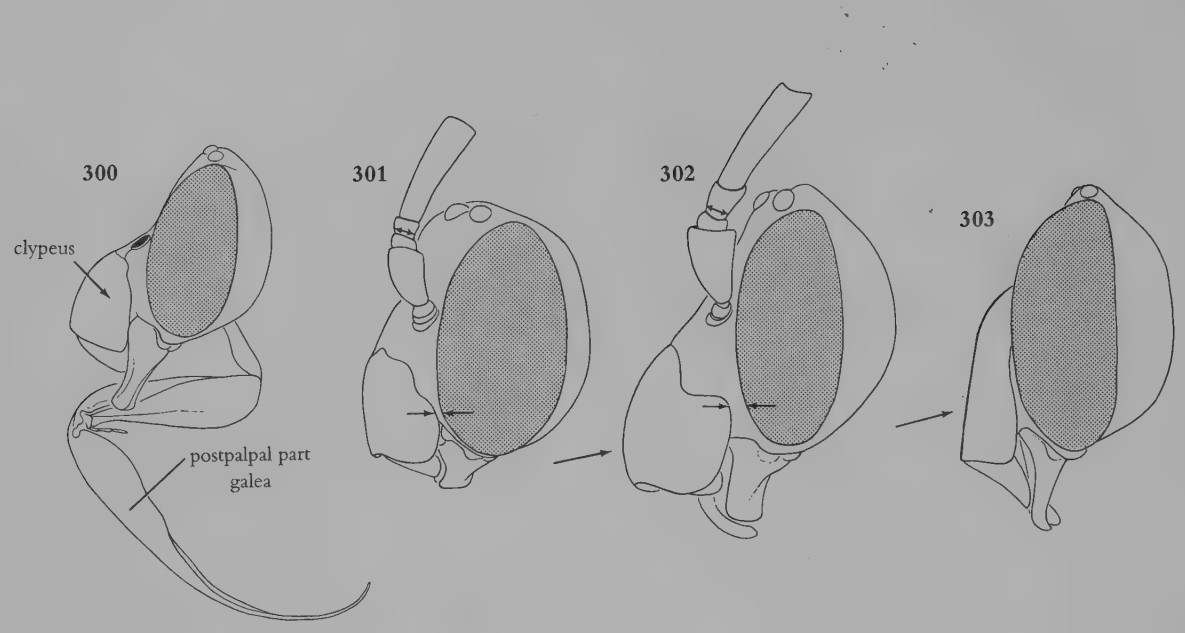
167(165). Espolón tibial anterior tan largo como el basitarso o algo mayor; margen posterior de S5 con emarginaciones laterales poco profundas, bordeadas de pelos largos, ganchudos, extendidos hacia atrás sobre las depresiones glabras, someras, y redondeadas de S6 [Fig. 298] (raro, SW) ..... *Idiomelissodes* [105]

— Espolón tibial anterior más corto que el basitarso; S5 no emarginado lateralmente y sin pelos laterales largos, ganchudos 168

168(167). Palpo maxilar usualmente con cuatro segmentos; si con cinco segmentos, entonces T2 con banda pubescente basal con al menos unos pocos pelos de base plumosa y de ápice espatulado [Fig. 299] ..... *Svastra* [113]

— Palpo maxilar con cinco o seis segmentos; T2 nunca con pelos espátulo-plumosos 169

169(168). Gálea con parte apical al palpo dos veces el largo del ojo o mayor [Fig. 300]; clípeo fuertemente protuberante [Fig. 300]; parte inferior de la carena paraocular prominente; antena larga, alcanzando el pterostigma o más allá en reposo (México) ..... *Loxoptilus* [106]



— Postpalpal part of galea 1.5 times as long as eye or shorter; clypeus variable [Figs. 301 and 302], often flat [Fig. 303]; paraocular carina variable, lower part often obsolete; antenna variable in length 170

170(169). Oculoclypeal distance extremely short, never more than about one-fourth of minimum width of first flagellar segment [Fig. 301] (mostly W and Mexico) ..... *Tetraloniella* (part) [116]

— Oculoclypeal distance short to long, equal to one-third of minimum width of first flagellar segment or more [Fig. 302] 171

171(170). S6 with oblique lateral apical carina straight [Fig. 304], sternum not toothed or angled laterally; antenna of moderate length, not reaching stigma in repose ..... *Peponapis* (part) [111]

— S6 almost always with oblique lateral apical carina curved outward and thickened basally, ending in a lateral blunt tooth or obtuse angle of the sternum [Fig. 305]; antenna usually long, reaching stigma in repose 172

172(171). Profile of clypeus distinctly convex [as in Fig. 302] ..... *Synhalonia* [114]

— Profile of clypeus nearly straight in spite of rather strong protuberance of clypeus [Fig. 303] (rare, Mexico) ..... *Pectinapis* [110]

— Gálea con parte apical al palpo 1,5 veces tan larga como el ojo o menor; clípeo variable [Figs. 301 y 302], frecuentemente plano [Fig. 303]; carena paraocular variable, parte inferior usualmente obsoleta; antena de largo variable 170

170(169). Distancia clípeo-ocular sumamente corta, aproximadamente nunca más de un cuarto del ancho mínimo del primer flagelómero [Fig. 301] (mayormente W y México) ..... *Tetraloniella* (parte) [116]

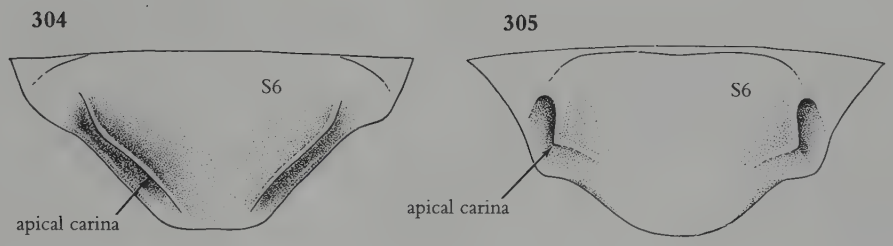
— Distancia clípeo-ocular corta a larga, igual o mayor a un tercio del ancho mínimo del primer flagelómero [Fig. 302] 171

171(170). S6 con carena apical lateral oblicua recta [Fig. 304], esterno no dentado o anguloso lateralmente; antena de largo moderado, no alcanzando el estigma en reposo ..... *Peponapis* (parte) [111]

— S6 casi siempre con carena apical lateral oblicua basalmente engrosada y curvada hacia afuera, terminando en diente romo lateral o ángulo obtuso del esterno [Fig. 305]; antena usualmente larga, alcanzando el estigma en reposo 172

172(171). Clípeo de perfil claramente convexo [como en Fig. 302] ..... *Synhalonia* [114]

— Clípeo de perfil casi recto, a pesar de ser bastante fuertemente protuberante [Fig. 303] (raro, México) ..... *Pectinapis* [110]



173(12). Marginal cell distal to stigma on costa little if any longer than stigma *and* second submarginal cell less than two-thirds as long as first* [Fig. 306] (second submarginal cell rarely absent) 174

— Marginal cell distal to stigma on costa longer than stigma [Fig. 307] or, if not, then second submarginal cell two-thirds as long as first or longer 175

174(173). Jugal lobe of posterior wing less than one-fourth as long as vannal lobe [Fig. 308]; body partly covered with appressed scalelike hairs [Fig. 496]; scopa absent (second submarginal cell sometimes absent) (Anthophoridae, Nomadinae, Neolarrini) (uncommon, mostly W) ..... *Neolarra* [142]

— Jugal lobe of posterior wing nearly three-fourths as long as vannal lobe or more [Fig. 309]; body without dense appressed pubescence; scopa on hind tibia of female (Andrenidae, Panurginae, part) .... *Perdita* (part) [17]

175(173). Second submarginal cell usually little, if any, more than half as long as first or rarely three-fifths as long [Fig. 310] and first recurrent vein received by first submarginal cell or meeting first transverse cubital, rarely beyond it (if second submarginal cell

173(12). Celda marginal sobre el margen costal, distalmente al estigma, poco o nada más larga que éste *y* segunda celda submarginal menos de dos tercios del largo de la primera* [Fig. 306] (segunda celda submarginal raramente ausente) 174

— Celda marginal sobre el margen costal, distalmente al estigma, más larga que éste [Fig. 307] o, *si no,* entonces segunda celda submarginal dos tercios o más del largo de la primera 175

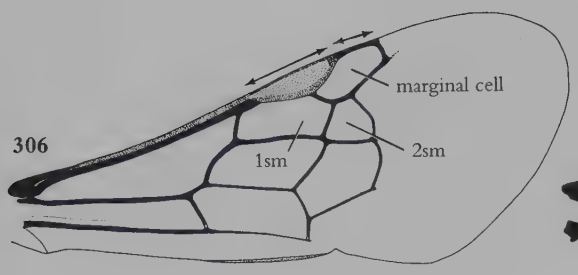
174(173). Lóbulo yugal del ala posterior menos de un cuarto del largo del lóbulo vanal [Fig. 308]; cuerpo parcialmente cubierto de pelos escamosos aplastados [Fig. 496]; escopa ausente (segunda celda submarginal a veces ausente) (Anthophoridae, Nomadinae, Neolarrini) (poco común, mayormente W) ..... *Neolarra* [142]

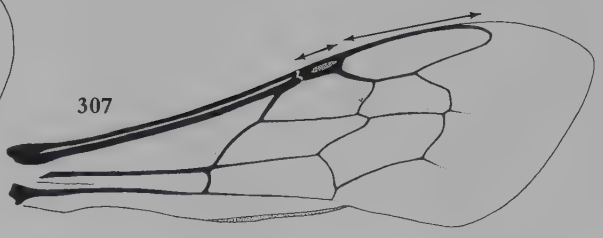
— Lóbulo yugal del ala posterior aproximadamente tres cuartos del largo del vanal o mayor [Fig. 309]; cuerpo sin pubescencia densa aplastada; hembra con escopa en la tibia posterior (Andrenidae, Panurginae, parte) ....*Perdita* (parte) [17]

175(173). Segunda celda submarginal usualmente poco o nada más larga que la mitad de la primera o raramente tres cuartos de ésta [Fig. 310] y primera vena recurrente se une a la primera celda submarginal o a la vena primera transversa cubital, raramente después de ésta (si la segunda

*Rarely—for example, in some specimens of *Perdita* subgenus *Macrotera* from Mexico—the marginal cell on the costal margin is only slightly longer than the stigma, and the second submarginal cell is two-thirds as long as the first. Such a specimen will run to couplet 175 and on to couplet 228, where the facial characters but not the others would agree with *Calliopsis*. Moreover, some specimens of *Panurginus* will run to couplet 174 and to *Perdita*. Most *Perdita* species are metallic, and in those with the second submarginal cell relatively long, that cell receives both recurrent veins. *Panurginus* is nonmetallic black, and the first recurrent vein is near or basal to the first transverse cubital vein.

*Raramente—por ejemplo, en algunos ejemplares de *Perdita* subgénero *Macrotera* de México—la celda marginal sobre la costa es levemente más larga que el estigma, y la segunda celda submarginal es dos tercios del largo de la primera. Estos ejemplares van a 175 y luego a 228, donde los caracteres faciales, pero no otros, concuerdan con *Calliopsis*. Además algunos ejemplares de *Panurginus* van a 174 y a *Perdita*. La mayoría de las especies de *Perdita* son metálicas, y en aquellas con la segunda celda submarginal relativamente larga, aquella celda recibe ambas venas recurrentes. Las especies de *Panurginus* son negras y no metálicas, y la primera vena recurrente está cerca o basalmente a la primera vena transversa cubital.


306
marginal cell
1sm
2sm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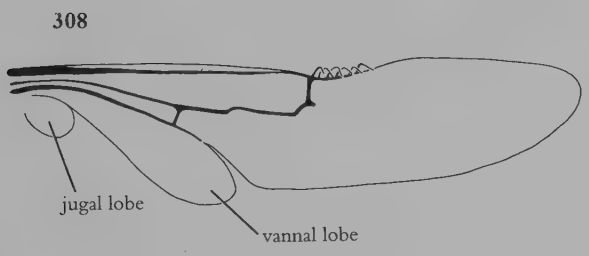
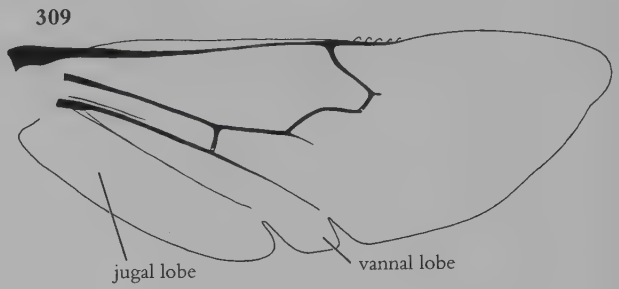

308
jugal lobe
vannal lobe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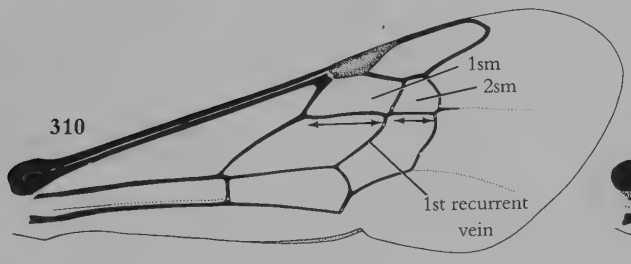
jugal lobe
vannal lobe


310
1sm
2sm
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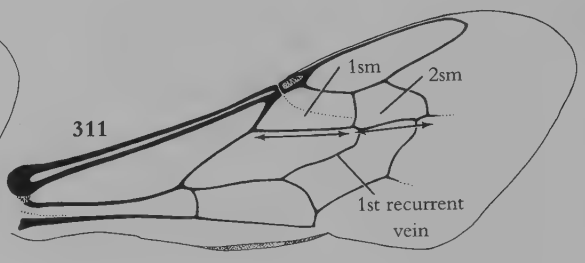
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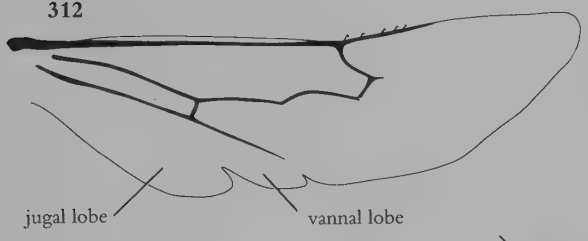
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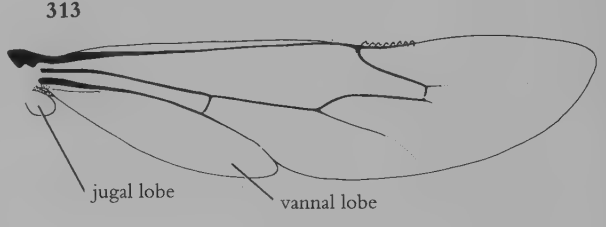
jugal lobe
vannal lobe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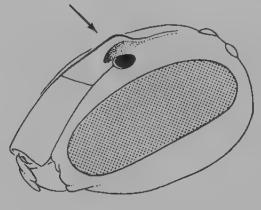
jugal lobe
vannal lobe


314

is two-thirds as long as first, then first recurrent vein clearly received by first submarginal cell); scopa absent (or in *Chilicola* limited to S1 to S3 and sparse hairs on hind leg) 176

— Second submarginal cell usually at least two-thirds as long as first and, except in *Hoplitis* (*Formicapis*) and *Panurginus* and rarely others, receiving first recurrent vein [Fig. 311]; scopa usually present 180

176(175). Jugal lobe of posterior wing about three-fourths as long as vannal lobe [Fig. 312]; glossa truncate or bilobed [as in Fig. 8] 177

— Jugal lobe of posterior wing less than one-fourth as long as vannal lobe [Fig. 313]; glossa pointed (Anthophoridae, Nomadinae, part) 178

177(176). Supraclypeal area between antennae abruptly and strongly elevated above antennal bases [Fig. 314]; both proboscidial fossa and prementum not longer than clypeus; scopa absent; face usually with yellow, at least on paraocular areas (Colletidae, Hylaeinae) ..... *Hylaeus* [7]

— Supraclypeal area between antennae convex but not abruptly elevated above antennal bases; proboscidial fossa and prementum much longer than clypeus; S1 to S3 with scopa; face black or with yellow on clypeus only (Colletidae, Xeromelissinae) (uncommon, tropical) ..... *Chilicola* [8]

178(176). Apical portion of marginal cell on wing margin [Fig. 315] (Nomadini) ..... *Nomada* (part) [145]

— Apical portion of marginal cell curved away from wing margin [Fig. 316] 179

179(178). Labrum much longer than broad [Fig. 317]; body coarsely punctate (Holcopasitini) (uncommon) ..... *Holcopasites* [141]

— Labrum broader than long [Fig. 318]; body finely punctate (Townsendiellini) (rare, SW) ..... *Townsendiella* (part) [148]

180(175). Axilla produced posteriorly to a lobe, angle, or spine lateral to scutellum [Fig. 319] 181

— Axilla rounded lateroposteriorly with no projection, usually continuing contour of scutellar margin 183

celda submarginal es dos tercios del largo de la primera, entonces la primera vena recurrente es recibida claramente por la primera celda submarginal); escopa ausente (o en *Chilicola* limitada a S1–S3 y esparcida en la pata posterior) 176

— Segunda celda submarginal usualmente al menos dos tercios tan larga como la primera y, excepto en *Hoplitis* (*Formicapis*), *Panurginus*, y raramente otros casos, recibiendo la primera vena recurrente [Fig. 311]; escopa usualmente presente 180

176(175). Lóbulo yugal del ala posterior alrededor de tres cuartos del largo del lóbulo vanal [Fig. 312]; glosa trunca o bilobada [como en Fig. 8] 177

— Lóbulo yugal del ala posterior menos de un cuarto del largo del lóbulo vanal [Fig. 313]; glosa aguda (Anthophoridae, Nomadinae, parte) 178

177(176). Area supraclipeal entre las antenas abrupta y fuertemente elevada por sobre las bases antenales [Fig. 314]; fosa de la proboscis y prementum no más largos que el clípeo; escopa ausente; cara usualmente con amarillo, al menos en el área paraocular (Colletidae, Hylaeinae) ..... *Hylaeus* [7]

— Area supraclipeal entre las antenas convexa pero no abruptamente elevada por sobre las bases antenales; fosa de la proboscis y prementum mucho más largos que el clípeo; S1 a S3 con escopa; cara negra o con amarillo sólo en el clípeo (Colletidae, Xeromelissinae) (poco común, tropical) ..... *Chilicola* [8]

178(176). Celda marginal con el extremo sobre el margen alar [Fig. 315] (Nomadini) ..... *Nomada* (parte) [145]

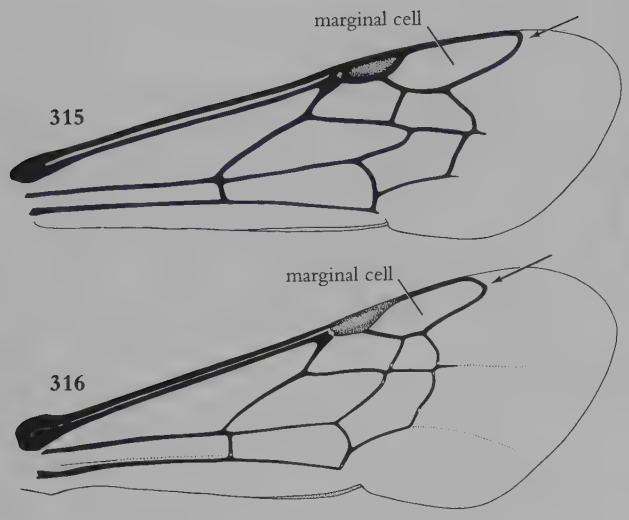
— Celda marginal con el extremo curvado, alejándose del margen alar [Fig. 316] 179

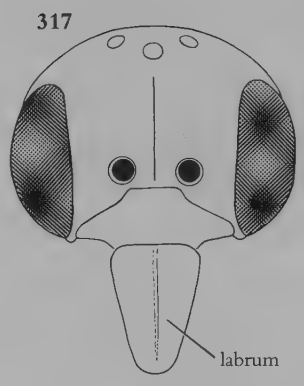
179(178). Labro mucho más largo que ancho [Fig. 317]; cuerpo fuertemente puntuado (Holcopasitini) (poco común) ..... *Holcopasites* [141]

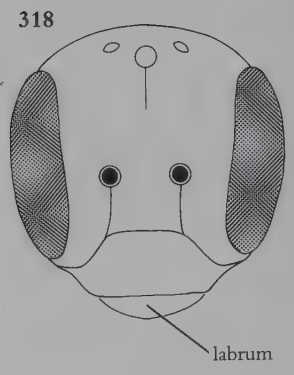
— Labro más ancho que largo [Fig. 318]; cuerpo finamente puntuado (Townsendiellini) (raro, SW) ..... *Townsendiella* (parte) [148]

180(175). Axila proyectada posteriormente en lóbulo, ángulo, o espina lateral al escutelo [Fig. 319] 181

— Axila redondeada lateralmente y posteriormente, sin proyección, usualmente continuando el contorno del margen del escutelo 183







181(180). Pygidial plate absent; labrum longer than broad; mandible with at least one preapical tooth... 182

— Pygidial plate present in both sexes [as in Fig. 320], although often hidden by T5 in females; labrum broader than long; mandible simple (Anthophoridae, Nomadinae, Epeolini, part)..... back to 112

182(181). Eyes hairy [Fig. 321] (except in female *Coelioxys bisoncornua* Hill from central U.S.A.); metanotum without median tooth or spine (Megachilidae, Megachilinae, Megachilini, part) ..... *Coelioxys* [76]

— Eyes bare; metanotum with median tooth or spine [Fig. 322] (Megachilidae, Megachilinae, Dioxyini) (rare, W) ..... *Dioxys* [75]

183(180). Apex of marginal cell pointed on costa or separated from costa by only one or two vein widths [as in Figs. 83 and 86]; stigma large (see couplet 26 for illustrations and more detail) 184

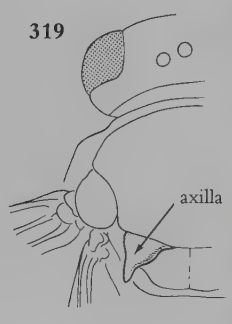
181(180). Placa pigidial ausente; labro más largo que ancho; mandíbula con un diente preapical al menos 182

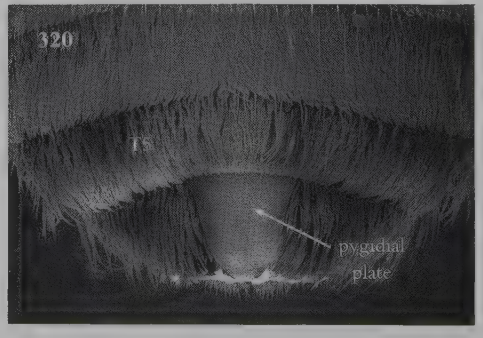
— Placa pigidial presente en ambos sexos [como en Fig. 320], aunque frecuentemente oculta por T5 en las hembras; labro más ancho que largo; mandíbula simple (Anthophoridae, Nomadinae, Epeolini, parte) ..... volver a 112

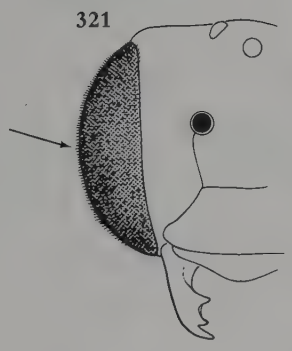
182(181). Ojos pilosos [Fig. 321] (excepto en hembra de *Coelioxys bisoncornua* Hill, del centro de E.U.A.); metanoto sin diente o espina media (Megachilidae, Megachilinae, Megachilini, parte)..... *Coelioxys* [76]

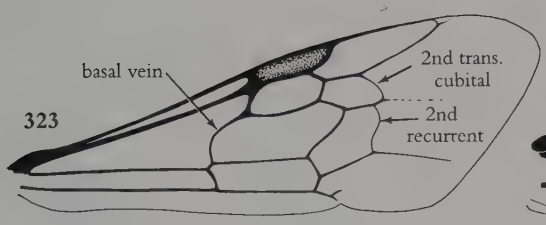
— Ojos glabros; metanoto con diente o espina media [Fig. 322] (Megachilidae, Megachilinae, Dioxyini) (raro, W) .. .. *Dioxys* [75]

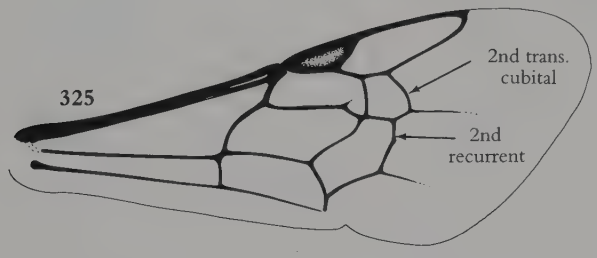
183(180). Celda marginal con ápice aguzado sobre el margen costal o, si alejado, sólo por una o dos veces el grosor de la vena costal [como en Figs. 83 y 86]; estigma grande (ver 26 para más detalle e ilustraciones) 184











— Apex of marginal cell rounded, truncate, or pointed and separated from costa by distance equal to several vein widths [as in Figs. 87–90]; stigma usually small (see couplet 26) 195

184(183). Basal vein strongly arcuate near base [Fig. 323] (Halictidae, Halictinae, Halictini, part) 185

— Basal vein gently and rather uniformly arcuate or straight [Fig. 324] 186

185(184). Second transverse cubital and second recurrent veins weaker than nearby veins, at least in females [Fig. 323]; femoral scopa distinct; body not especially coarsely sculptured [as in Figs. 149 and 152]; head narrow to moderately broad in frontal view [Fig. 326] (Subgroups sometimes recognized as genera are characterized in "Notes.") .... *Lasioglossum* (part) [40]

— Distal venation of forewing uniformly strong [Fig.

— Celda marginal con ápice redondeado, trunco, o, si en punta, separado del margen costal por varias veces el grosor de la vena [como en Figs. 87–90]; estigma usualmente pequeño (ver 26) 195

184(183). Vena basal fuertemente arqueada cerca de la base [Fig. 323] (Halictidae, Halictinae, Halictini, parte) 185

— Vena basal suave y más bien uniformemente arqueada o recta [Fig. 324] 186

185(184). Venas segunda transversa cubital y segunda recurrente más débiles que las venas contiguas, al menos en hembras [Fig. 323]; escopa femoral conspicua; cuerpo con escultura no especialmente gruesa [como en Figs. 149 y 152]; cabeza angosta a moderadamente ancha en vista frontal [Fig. 326] (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") .... *Lasioglossum* (parte) [40]

— Ala anterior con venación distal uniformemente fuerte

325]; scopa absent; body and especially base of propodeum coarsely sculptured [as in Figs. 148 and 151]; head conspicuously broad in frontal view [Fig. 327] ..... *Sphecodes* (part) [47]

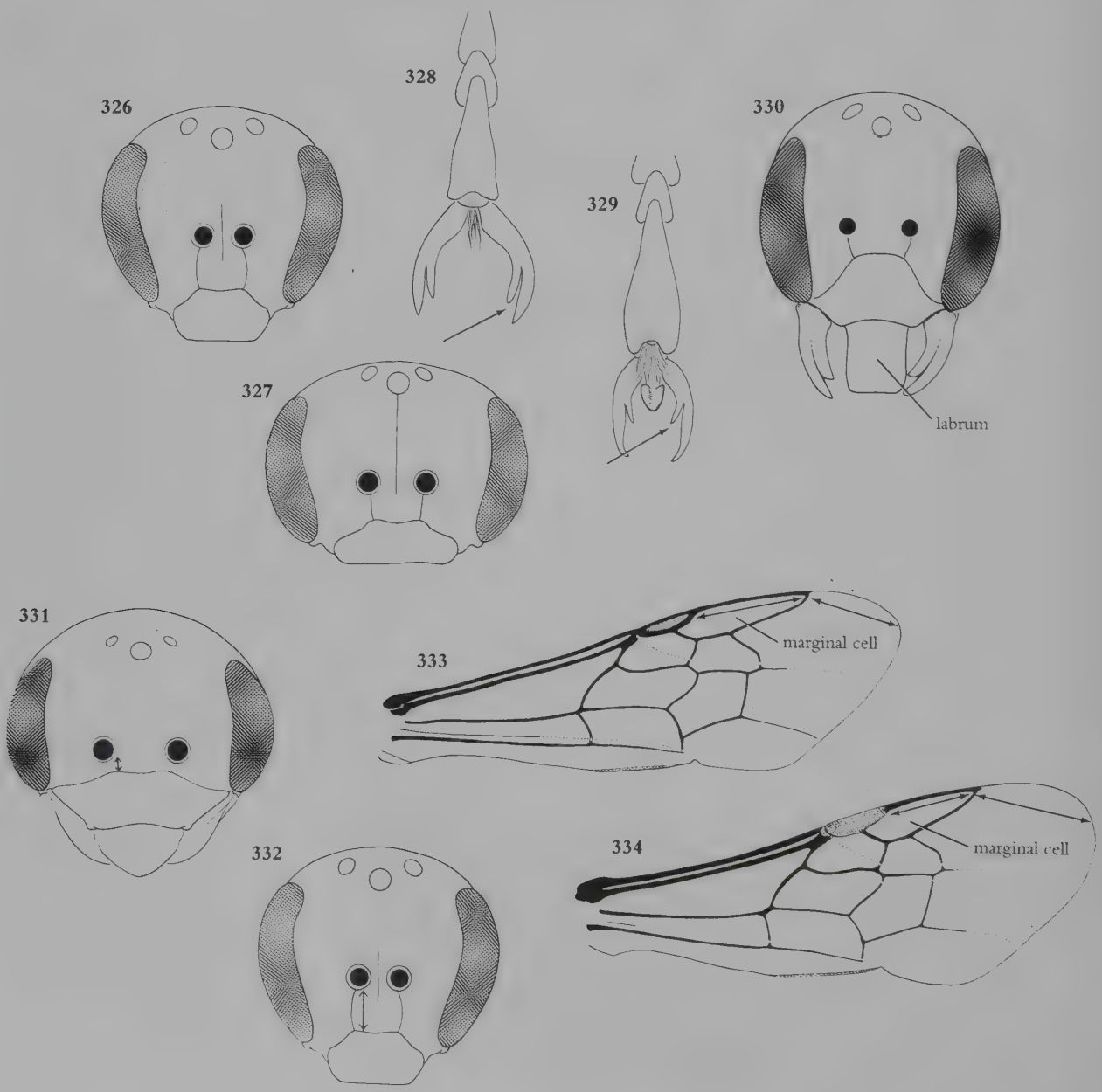
186(184). Labrum broader than long; scopa, if present, on hind legs [Figs. 344–346]; claws cleft or with inner preapical tooth [as in Figs. 328 and 329] 187

— Labrum rectangular, longer than broad [Fig. 330]; scopa of female on metasomal sterna [Fig. 23]; claws

[Fig. 325]; escopa ausente; cuerpo y especialmente base del propodeo gruesamente esculturados [Figs. 148 y 151]; cabeza conspicuamente ancha en vista frontal [Fig. 327].. ..... *Sphecodes* (parte) [47]

186(184). Labro más ancho que largo; escopa, cuando presente, sobre las patas posteriores [Figs. 344–346]; uñas bífidas o con diente preapical interno [Figs. 328 y 329]..... 187

— Labro más largo que ancho, rectangular [Fig. 330]; hembra con escopa en los esternos del metasoma [Fig. 23];



of female simple (Megachilidae, Megachilinae, Osmiini, part)..... *Chelostoma* (part) [79]

187(186). Antennal bases well below middle of face and separated from clypeus by not much more than diameter of antennal socket [Fig. 331]; clypeus short, transverse, its upper margin not much arched up into face; labrum nearly as long as clypeus [Fig. 331]; pre-episternal groove present [Fig. 59] (Halictidae, Rophitinae, part) 188

— Antennal bases near middle of face or, if below, separated from clypeus by much more than diameter of antennal socket [Fig. 332]; clypeus with upper margin strongly arched up into face so that it is not short and transverse; labrum, excluding apical process if any, much shorter than clypeus; pre-episternal groove absent below scrobal groove [Fig. 58] ... 190

188(187). Distance from apex of stigma to apex of marginal cell almost always at least as great as distance from apex of cell to wing tip [Fig. 333]; S8 of male without spiculum, with a pair of basal lobes (Subgroups sometimes recognized as genera are characterized in "Notes.")..... *Dufourea* [51]

— Distance from apex of stigma to apex of marginal cell less than or equal to distance from apex of cell to wing tip [Fig. 334]; S8 of male with blunt median basal angle (spiculum, as in Fig. 21) and without basal lobes (SW)..... 189

189(188). Dorsal surface of propodeum more than twice as long as metanotum [as in Fig. 336]; clypeal margin of female truncate or scarcely rounded between lateral tubercles [as in Fig. 337] .... *Micralictoides* [53]

— Dorsal surface of propodeum less than twice as long as metanotum [as in Fig. 335]; clypeal margin of female strongly rounded between lateral tubercles [Fig. 338] (rare)..... *Michenerula* [52]

190(187). Jugal lobe of hind wing small, one-sixth as long as vannal lobe or less [Fig. 339]; scopa absent; proboscis long, first two segments of labial palpus long and sheathlike, unlike last two segments [Fig. 6] (Anthophoridae, Nomadinae, Nomadini, part)..... 191

— Jugal lobe of hind wing one-fourth to over three-

uñas de la hembra simples (Megachilidae, Megachilinae, Osmiini, parte)..... *Chelostoma* (parte) [79]

187(186). Bases antenales bien por debajo de la mitad de la cara, separadas del clípeo por no mucho más del diámetro del alvéolo antenal [Fig. 331]; clípeo corto, transverso, el margen superior no muy arqueado hacia arriba; labro casi tan largo como el clípeo [Fig. 331]; surco pre-episternal presente [Fig. 59] (Halictidae, Rophitinae, parte)..... 188

— Bases antenales cerca de la mitad de la cara o, si por debajo, separadas del clípeo por mucho más del diámetro del alvéolo antenal [Fig. 332]; clípeo con margen superior fuertemente arqueado hacia arriba de modo que no es corto y transverso; labro, excluyendo el proceso apical si lo hubiese, mucho más corto que el clípeo; surco pre-episternal ausente por debajo del surco scrobal [Fig. 58].. 190

188(187). Distancia del ápice del estigma al ápice de la celda marginal casi siempre al menos tan grande como la distancia del ápice de la celda al ápice del ala [Fig. 333]; S8 del macho sin spiculum, con un par de lóbulos basales (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.")..... *Dufourea* [51]

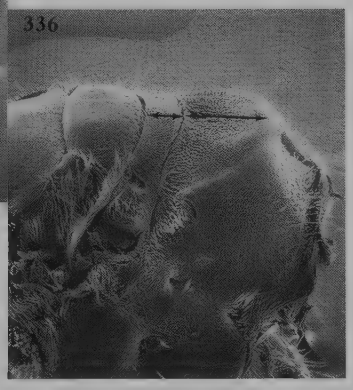
— Distancia del ápice del estigma al ápice de la celda marginal menor o igual a la distancia del ápice de la celda al ápice del ala [Fig. 334]; S8 del macho con un ángulo medio basal romo (spiculum, como en Fig. 21) y sin lóbulos basales (SW) 189

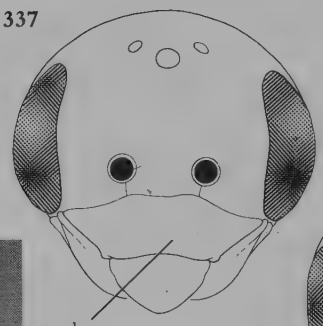
189(188). Superficie dorsal del propodeo más de dos veces del largo del metanoto [como en Fig. 335]; hembra con clípeo de margen truncado o levemente redondeado entre tubérculos laterales [como en Fig. 337] ..... *Micralictoides* [53]

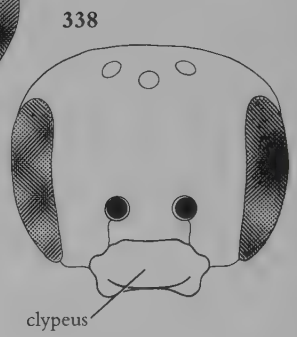
— Superficie dorsal del propodeo menos de dos veces del largo del metanoto [como en Fig. 336]; hembra con clípeo de margen fuertemente redondeado entre tubérculos laterales [Fig. 338] (raro) ..... *Michenerula* [52]

190(187). Lóbulo yugal del ala posterior pequeño, un sexto o menos del largo del lóbulo vanal [Fig. 339]; escopa ausente; proboscis larga, primeros dos segmentos del palpo labial largos y planos, diferentes a los dos últimos [Fig. 6] (Anthophoridae, Nomadinae, Nomadini, parte)..... 191

— Lóbulo yugal del ala posterior de un cuarto a más de tres cuartos del largo del lóbulo vanal [Fig. 340]; hembra con







fourths as long as vannal lobe [Fig. 340]; scopa present on hind legs of female; proboscis short, the four labial palpal segments similar, not long and sheathlike [Fig. 8] 193

191(190). Metasomal terga with bands of appressed, pale pubescence [Fig. 96]; body black or metasoma red (rare, SW) ..... *Hexepeolus* (part) [143]

— Metasomal terga without pubescent bands; body often red or black with yellow areas 192

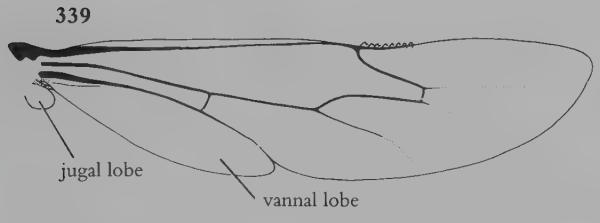
192(191). Mandible with anterior (acetabular) articulation more distant from eye than posterior (condylar) articulation [Fig. 341] ..... *Nomada* (part) [145]

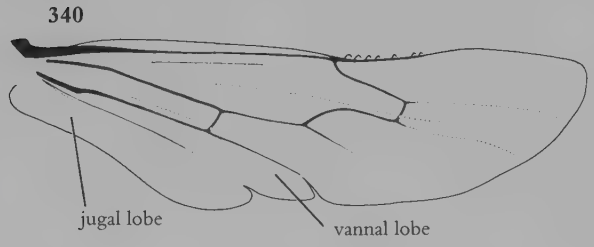
escopa en las patas posteriores; proboscis corta, palpo labial con los cuatro segmentos similares, no largos y planos [Fig. 8] 193

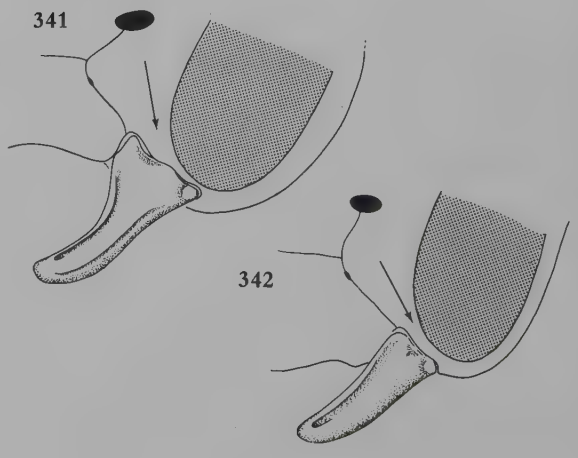
191(190). Tergos del metasoma con bandas de pubescencia clara, aplastada [Fig. 96]; cuerpo negro o el metasoma rojo (raro, SW) ..... *Hexepeolus* (parte) [143]

— Tergos del metasoma sin bandas pubescentes; cuerpo frecuentemente rojo o negro con áreas amarillas 192

192(191). Mandíbula con articulación anterior (acetabular) más alejada del ojo que la posterior (condilar) [Fig. 341] ..... *Nomada* (parte) [145]







— Mandible with articulations equidistant from eye [Fig. 342] (rare, W) ..... *Melanomada* (part) [144]

193(190). Female with distinct facial foveae covered with dense, short hairs [Fig. 343]; scopa well developed on hind femur and trochanter [Fig. 344]; two subantennal sutures under each antenna [Fig. 343] (Andrenidae, Andreninae, part) .... *Andrena* (part) [10]

— Facial foveae absent; scopa principally on hind tibia [Figs. 345 and 346]; one subantennal suture under each antenna (Melittidae, part) 194

194(193). Posterior basitarsus of both sexes more slender than, and nearly as long as, posterior tibia [Fig. 345] (Dasypodinae) ..... *Hesperapis* [57]

— Posterior basitarsus of male less than half as long as tibia, of female conspicuously shorter than and as broad as tibia [Fig. 346] (Melittinae, part) (uncommon, eastern and northern North America) .... *Macropis* [58]

195(183). Mandible tridentate, middle tooth longer and more elevated than the others [Fig. 347]; outer surfaces of tibiae, at least in female, with numerous coarse spicules not bearing hairs or bristles [Fig. 348]; labrum longer than broad (Megachilidae, Lithurginae) (mostly W) ..... *Lithurge* [60]

— Mandible simple or with lower tooth longest [as in Figs. 372 and 375], number of teeth variable; outer

— Mandíbula con articulaciones equidistantes del ojo [Fig. 342] (raro, W) ..... *Melanomada* (parte) [144]

193(190). Hembra con fóveas faciales conspicuas cubiertas por pelitos densos [Fig. 343]; escopa bien desarrollada sobre fémur y trocánter posteriores [Fig. 344]; con dos suturas subantenales bajo cada antena [Fig. 343] (Andrenidae, Andreninae, parte) ..... *Andrena* (parte) [10]

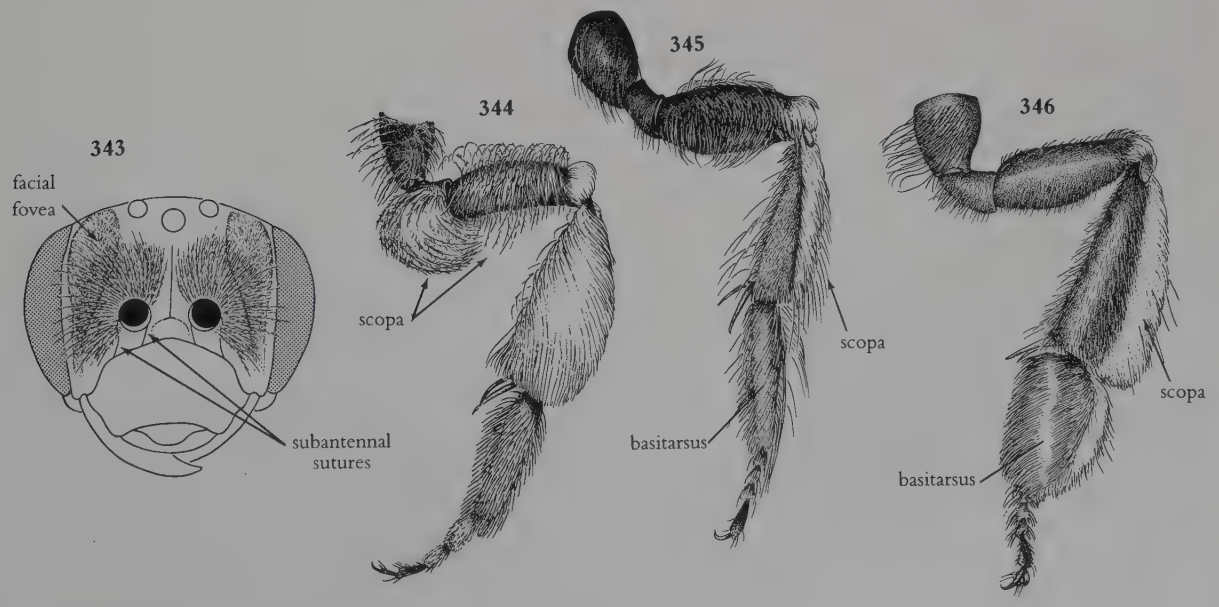
— Fóveas faciales ausentes; escopa principalmente sobre la tibia posterior [Figs. 345 y 346]; una sutura subantenal bajo cada antena (Melittidae, parte) 194

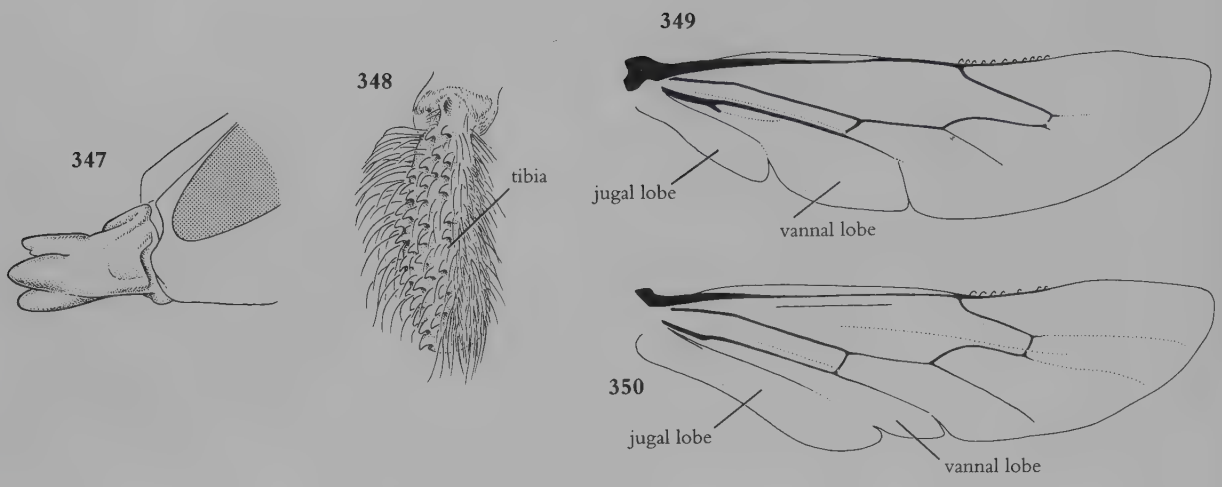
194(193). Ambos sexos con basitarso posterior más angosto y casi tan largo como la tibia posterior [Fig. 345] (Dasypodinae) ..... *Hesperapis* [57]

— Macho con basitarso posterior menos de la mitad del largo de la tibia, en la hembra conspicuamente más corto y más ancho que la tibia [Fig. 346] (Melittinae, parte) (poco común, este y norte de América del Norte) .... *Macropis* [58]

195(183). Mandíbula tridentada, diente medio más largo y más elevado que los otros [Fig. 347]; superficie externa de las tibias, al menos en la hembra, con numerosas espículas gruesas carentes de pelos o setas [Fig. 348]; labro más largo que ancho (Megachilidae, Lithurginae) (mayormente W) ..... *Lithurge* [60]

— Mandíbula simple o con diente inferior el más fuerte [como en Figs. 372 y 375], número de dientes variable;





surfaces of tibiae, if spiculate, with a bristle arising from apex of each, except in some parasitic forms that lack scopa and have labrum broader than long 196

196(195). Jugal lobe of hind wing less, usually much less, than two-thirds as long as vannal lobe [Fig. 349]; proboscis long; first two segments of labial palpus long, sheathlike, unlike segments 3 and 4 [Fig. 6]... 197

— Jugal lobe of hind wing at least nearly three-fourths as long as vannal lobe [Fig. 350]; first two segments of labial palpus not long and sheathlike, either all four segments similar or only first segment elongate [Fig. 8] (Andrenidae, Panurginae, part)..... 228

197(196). Marginal cell not or scarcely extending beyond submarginal cells [as in Fig. 351] (Anthophoridae, Anthophorinae, Melectini, part) (very rare, "Nevada") ..... *Brachymelecta* [123]

— Marginal cell extending well beyond second submarginal cell [Figs. 352 and 353]..... 198

198(197). Apex of marginal cell bent sharply away from wing margin, so that it is obliquely truncate [Fig. 352]; mandible simple; scopa, when present, on hind tibia and basitarsus..... 199

— Apex of marginal cell gradually bent away from wing margin, pointed or narrowly rounded [Fig. 353]; mandible usually with one or more teeth above the long lower tooth (rutellum); scopa, when present, on metasomal sterna..... 200

superficie externa de las tibias, si con espículas, éstas llevan una seta apical, excepto en algunas formas parasíticas que carecen de escopa y tienen labro más ancho que largo..... 196

196(195). Lóbulo yugal del ala posterior menos, y usualmente mucho menos, de dos tercios del largo del lóbulo vanal [Fig. 349]; proboscis larga; palpo labial con los primeros dos segmentos largos, planos, diferentes a los segmentos 3 y 4 [Fig. 6]..... 197

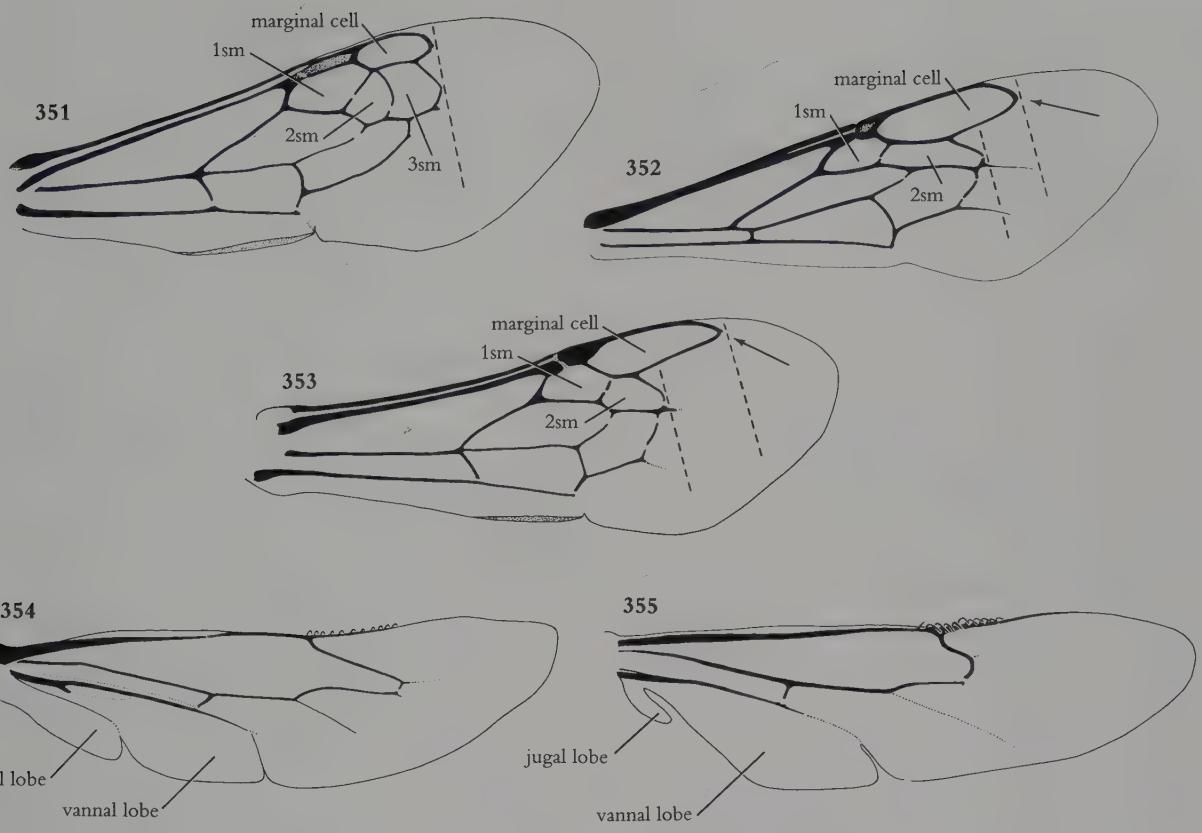
— Lóbulo yugal del ala posterior al menos tres cuartos del largo del lóbulo vanal [Fig. 350]; palpo labial con los primeros dos segmentos no largos y planos, los cuatro similares o sólo el primero alargado [Fig. 8] (Andrenidae, Panurginae, parte)..... 228

197(196). Celda marginal excediendo poco o nada las celdas submarginales [como en Fig. 351] (Anthophoridae, Anthophorinae, Melectini, parte) (muy raro, "Nevada")..... ..... *Brachymelecta* [123]

— Celda marginal extendiéndose mucho más allá de la segunda celda submarginal [Figs. 352 y 353]..... 198

198(197). Celda marginal con ápice bruscamente alejado del margen alar, de modo que es oblicuamente trunco [Fig. 352]; mandíbula simple; escopa, cuando presente, sobre tibia y basitarso posteriores..... 199

— Celda marginal con ápice gradualmente alejado del margen alar, aguzado o angostamente redondeado [Fig. 353]; mandíbula usualmente con uno o más dientes además del largo diente inferior (rutellum); escopa, cuando presente, sobre los esternos del metasoma..... 200



199(198). Jugal lobe of hind wing at least one-third as long as vannal lobe [Fig. 354]; scopa well developed on hind tibia and basitarsus; labrum much broader than long (Anthophoridae, Anthophorinae, Exomalopsini, part) ..... *Exomalopsis* (part) [120]

— Jugal lobe of hind wing less than one-third as long as vannal lobe [Fig. 355]; scopa absent; labrum much longer than broad (Anthophoridae, Nomadinae, Ammobatini) (rare, W)... *Oreopasites* [134]

200(198). Labrum much broader than long [Fig. 356]; mandible simple or with a single preapical tooth on upper margin; scopa absent (Anthophoridae, Nomadinae, part) (rare, SW) 201

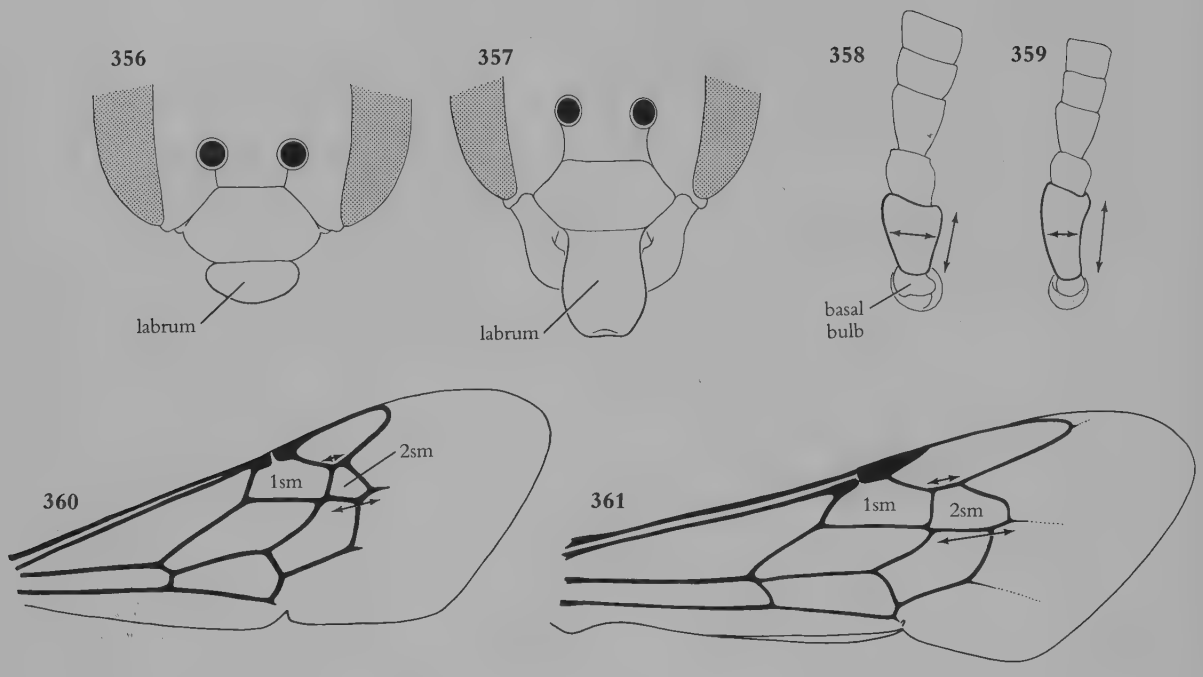
— Labrum longer than broad [Fig. 357]; mandible with one to several teeth or a long apical margin above lower tooth (which is mandibular apex) [Figs. 371, 372, and 375] (Megachilidae, Megachilinae)... 203

199(198). Lóbulo yugal del ala posterior al menos un tercio del largo del lóbulo vanal [Fig. 354]; escopa bien desarrollada sobre tibia y basitarso posteriores; labro mucho más ancho que largo (Anthophoridae, Anthophorinae, Exomalopsini, parte)..... *Exomalopsis* (parte) [120]

— Lóbulo yugal del ala posterior menos de un tercio del largo del lóbulo vanal [Fig. 355]; escopa ausente; labro mucho más largo que ancho (Anthophoridae, Nomadinae, Ammobatini) (raro, W)..... *Oreopasites* [134]

200(198). Labro mucho más ancho que largo [Fig. 356]; mandíbula simple o con un solo diente preapical en el margen superior; escopa ausente (Anthophoridae, Nomadinae, parte) (raro, SW)..... 201

— Labro más largo que ancho [Fig. 357]; mandíbula con uno o más dientes o con un margen apical extendido por arriba del diente inferior (el cual forma el ápice mandibular) [Figs. 371, 372, y 375] (Megachilidae, Megachilinae) 203



201(200). Scape, excluding basal bulb, less than twice as long as broad [Fig. 358]; T6 of female without pygidial plate, apical margin broadly concave; mandible with preapical tooth (Biastini, part)..... ..... *Neopasites* [135]

— Scape, excluding basal bulb, more than twice as long as broad [Fig. 359]; T6 of female with pygidial plate (incompletely defined in *Rhopalolemma*), apical margin not concave; mandible simple.....202

202(201). Anterior margin of second submarginal cell less than one-third of posterior length [Fig. 360]; T5 of female without pseudopygidial area; T6 of female with well-defined pygidial plate and no pygidial fimbria (Townsendiellini, part) .... *Townsendiella* (part) [148]

— Anterior margin of second submarginal cell nearly half length of posterior margin [Fig. 361]; T5 of female with pseudopygidial area about three times as wide as long; T6 of female with pygidial plate indicated laterally by carinae, but apex with a pygidial fimbria of short hairs and no sharply defined apex of the plate (Biastini, part) ..... *Rhopalolemma* [136]

203(200). Thorax and/or metasoma with yellow or white (rarely red) integumental markings or rarely entire

201(200). Escapo, excluyendo el bulbo basal, menos de dos veces tan largo como ancho [Fig. 358]; T6 de la hembra sin placa pigidial, margen apical ampliamente cóncavo; mandíbula con diente preapical (Biastini, parte)..... ..... *Neopasites* [135]

— Escapo, excluyendo el bulbo basal, más de dos veces tan largo como ancho [Fig. 359]; T6 de la hembra con placa pigidial (incompletamente definida en *Rhopalolemma*), margen apical no cóncavo; mandíbula simple 202

202(201). Segunda celda submarginal con margen anterior menor que un tercio del largo posterior [Fig. 360]; T5 de la hembra sin área pseudopigidial; T6 de la hembra con placa pigidial bien definida y sin fimbria pigidial (Townsendiellini, parte)..... *Townsendiella* (parte) [148]

— Segunda celda submarginal con margen anterior casi la mitad del largo posterior [Fig. 361]; T5 de la hembra con área pseudopigidial aproximadamente tres veces tan ancha como larga; T6 de la hembra con placa pigidial indicada lateralmente por carenas, pero ápice no claramente definido y con una fimbria pigidial de pelos cortos (Biastini, parte) ..... *Rhopalolemma* [136]

203(200). Tegumento del tórax y/o metasoma con manchas amarillas o blancas (raramente rojas) o raramente todo el

body red with black or yellowish markings; metasomal terga ordinarily without apical bands of pale hair (Megachilidae, Megachilinae, Anthidiini, part) 204

— Thorax and metasoma without integumental markings, entire body black or metallic or metasoma alone red; metasomal terga often with apical bands of pale hair (rarely terga with narrow apical cream-colored margins) 219

204(203). Middle tibia with two spines at apex on outer side [Fig. 362] (for small specimens, examine in distal view); scopa of female absent 205

— Middle tibia with one apical spine [Fig. 363] or without distinct spine; scopa of female usually present, on metasomal sterna 207

205(204). Hind tibia with a single prominent tooth or tibial spine (usually hidden among hairs) on apical margin near apex of outer margin of tibia [Fig. 364]; hind basitarsus with strong lamella-like carina along outer margin, separated by longitudinal depression from longitudinal thickening of outer surface of basitarsus (rare) ..... *Protostelis* [72]

— Apex of hind tibia with median tooth or tibial spine, and less prominent, rounded projection near apex of outer margin of tibia [Fig. 365]; hind basitarsus unmodified 206

cuerpo rojo con manchas negras o amarillentas; tergos del metasoma comúnmente sin bandas apicales de pelos claros (Megachilidae, Megachilinae, Anthidiini, parte) 204

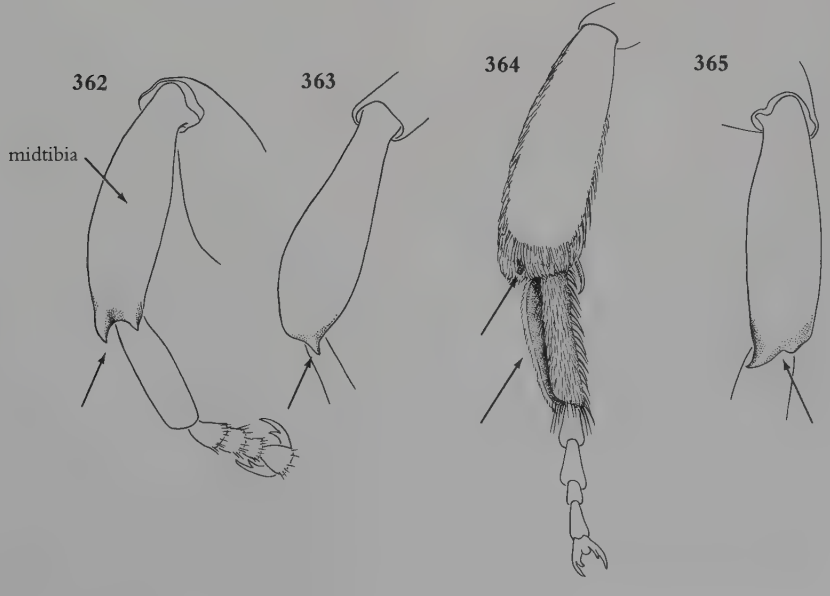
— Tegumento del tórax y metasoma sin manchas, cuerpo entero negro o metálico o sólo el metasoma rojo; tergos del metasoma frecuentemente con bandas apicales de pelos claros (raramente los tergos con margen apical angosto de color crema) 219

204(203). Tibia media con dos espinas apicales externas [Fig. 362] (en especímenes pequeños, observar en vista distal); escopa de la hembra ausente 205

— Tibia media con una espina apical [Fig. 363] o sin espina distinguible; escopa de la hembra usualmente presente, sobre los esternos del metasoma 207

205(204). Tibia posterior con un diente único prominente o espina tibial (usualmente oculta entre pelos) en el margen apical, cerca del ápice del borde externo de la tibia [Fig. 364]; basitarso posterior a lo largo del margen externo con una fuerte carena en forma de lámina, separada de un engrosamiento longitudinal de la superficie externa por una depresión longitudinal (raro) ..... *Protostelis* [72]

— Apice de la tibia posterior con diente medio o espina tibial y una proyección redondeada, menos prominente, cerca del ápice del borde externo de la tibia [Fig. 365]; basitarso posterior no modificado 206



206(205). Base of propodeum with subhorizontal zone set off by carina and divided into a series of pits [Fig. 366]; anterior surface of mesepisternum sparsely punctate at least below and set off from lateral surface by sharp angle of carina (uncommon) ..... *Dolichostelis* [66]

— Base of propodeum vertical or sloping, without series of pits or with such pits usually present only laterally; anterior surface of mesepisternum punctate and rounding onto lateral surface (uncommon) ..... *Stelis* (part) [73]

207(204). Arolia absent [as in Fig. 367] 208

— Arolia present [as in Fig. 368] (although commonly smaller than in most bees and sometimes minute) 211

206(205). Base del propodeo con una zona subhorizontal delimitada por una carena y dividida en una serie de hoyuelos [Fig. 366]; superficie anterior del mesepisterno laxamente puntuada, al menos abajo, y separada de la superficie lateral por un ángulo acentuado o una carena (poco común) ..... *Dolichostelis* [66]

— Base del propodeo vertical o inclinada, sin series de hoyuelos, o éstos usualmente presentes sólo lateralmente; superficie anterior del mesepisterno puntuada, unida a la superficie lateral en curva suave (poco común) ..... *Stelis* (parte) [73]

207(204). Arolios ausentes [como en Fig. 367] 208

— Arolios presentes [como en Fig. 368] (aunque comúnmente más pequeños que en la mayoría de las abejas y a veces diminutos) 211

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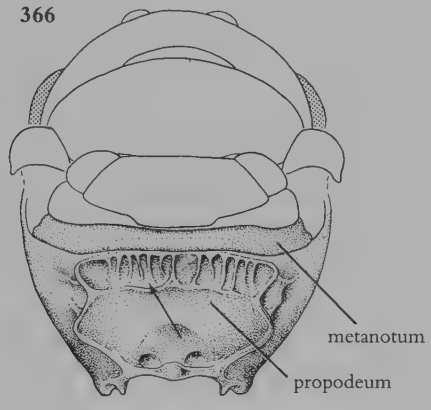

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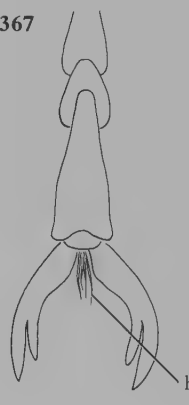

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208(207). Propodeum without fovea behind spiracle [Fig. 369]; mesepisternum usually without or with weak carina separating surfaces; mandible of female with five or more close-set teeth [Fig. 371] (Subgroups sometimes recognized as genera are characterized in "Notes.") ..... *Anthidium* [62]

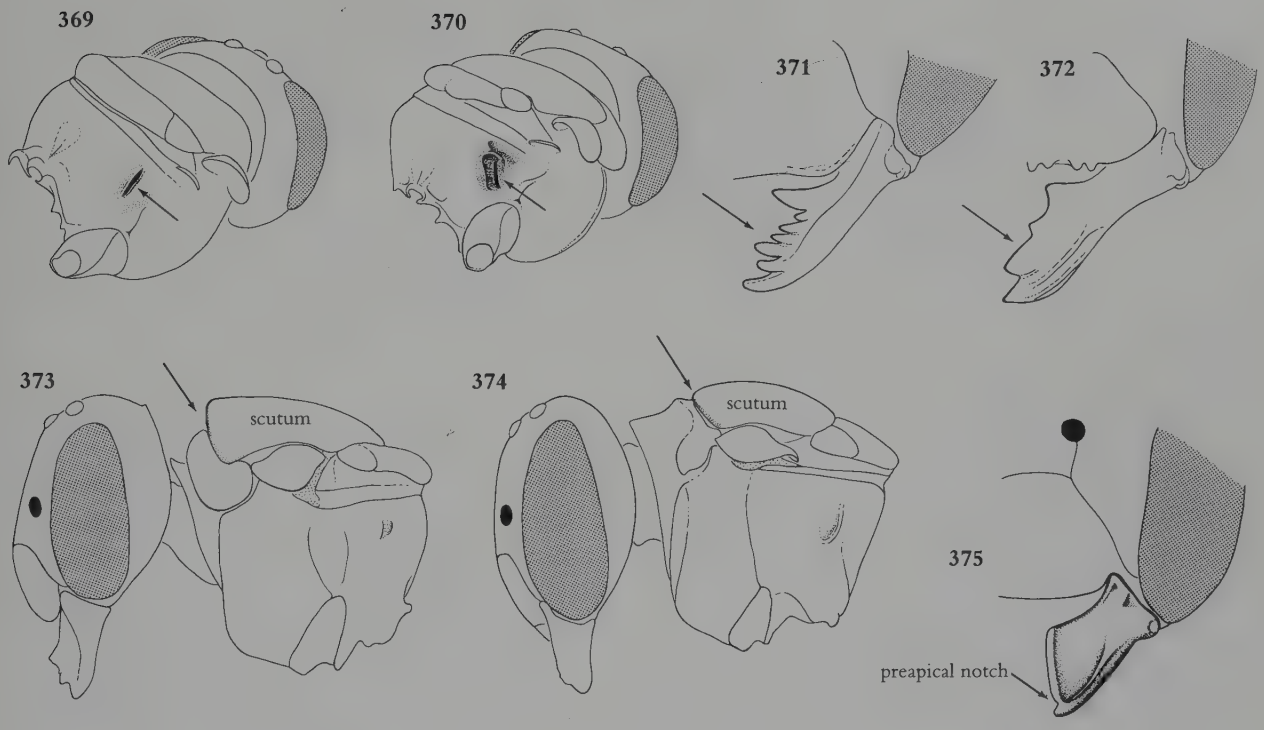
— Propodeum with large fovea behind spiracle [Fig. 370]; mesepisternum with carina separating anterior from lateral surfaces, at least above; mandible of female with four or less well-separated teeth [Fig. 372] 209

209(208). Anterior margin of scutum abruptly declivous, steeply sloping or vertical, in contrast to dorsal surface [Fig. 373], the two surfaces separated by trans-

208(207). Propodeo sin fóvea detrás del espiráculo [Fig. 369]; mesepisterno usualmente sin carena o con carena débil separando dos superficies; mandíbula de la hembra con cinco o más dientes próximos [Fig. 371] (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") ..... *Anthidium* [62]

— Propodeo con una gran fóvea detrás del espiráculo [Fig. 370]; mesepisterno con carena separando la superficie anterior de la lateral, al menos arriba; mandíbula de la hembra con cuatro o menos dientes bien separados [Fig. 372] 209

209(208). Margen anterior del escudo abruptamente declive, empinado o vertical, contrastando con la superficie dorsal [Fig. 373], las dos superficies separadas por una carena



verse carina (weak medially); preoccipital carina strong; mandible of female with preapical notch above which is long, untoothed margin [Fig. 375]; T7 of male trilobed, median lobe small, lateral lobes broad (Subgroups sometimes recognized as genera are characterized in "Notes.") ..... *Dianthidium* (part) [65]

— Anterior end of scutum without transverse carina [Fig. 374]; preoccipital carina absent; mandible of female with four widely separated teeth [Fig. 372]; T7 of male broadly rounded to bilobed (tropical) ... 210

210(209). Distinct, brow-like oblique carina mesal to each antennal socket [Fig. 376]; S5 of male with apical comb; T7 of male bifid or deeply bilobed [Fig. 377] (rare) (Subgroups sometimes recognized as genera are characterized in "Notes.") ..... *Hypanthidiodes* (part) [69]

— Interantennal carinae absent; S5 of male without comb; T7 of male rounded or weakly bilobed..... *Hypanthidium* [70]

211(207). Scopa of female absent; inner basal angle of mandible usually with strong protuberance,

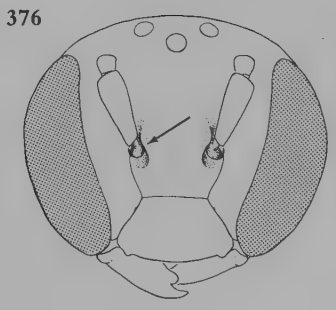
transversa (débil al medio); carena preoccipital fuerte; mandíbula de la hembra con una muesca preapical grande arriba, margen sin dientes [Fig. 375]; T7 del macho trilobado, lóbulo medio pequeño, los laterales anchos (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") ..... *Dianthidium* (parte) [65]

— Extremo anterior del escudo sin carena transversa [Fig. 374]; carena preoccipital ausente; mandíbula de la hembra con cuatro dientes bien separados [Fig. 372]; T7 del macho anchamente redondeado o bilobado (tropical) ... 210

210(209). Cada alvéolo antenal con una conspicua carena mesal oblicua en forma de ceja [Fig. 376]; S5 del macho con peine apical; T7 del macho bífido o profundamente bilobado [Fig. 377] (raro) (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") ..... *Hypanthidiodes* (parte) [69]

— Carenas interantenales ausentes; S5 del macho sin peine; T7 del macho redondeado o débilmente bilobado..... *Hypanthidium* [70]

211(207). Escopa de la hembra ausente; ángulo basal interno de la mandíbula con fuerte protuberancia, en forma de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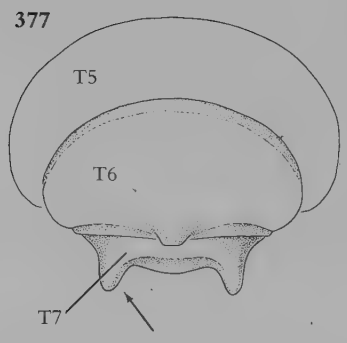

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toothlike or cariniform (lower in male than in female); S3 of male with fringe of long hairs curved mesad (rare, tropical) ..... *Hoplostelis* [68]

— Scopa present; base of mandible not protuberant; S3 of male without fringe or with fringe of shorter hairs not curved mesad 212

212(211). Scutellum extending posteriorly as broad, thin, truncate lamella [Fig. 378] overhanging metanotum and propodeum [Fig. 379]; subantennal sutures distinctly arcuate outward [Fig. 382] (uncommon) .... *Anthidiellum* [61]

— Scutellum rounded or rarely bilobed posteriorly as seen from above [Fig. 380], sometimes not overhanging metanotum and propodeum [Fig. 381], not lamellate although sometimes with carinate margin; subantennal sutures not conspicuously arcuate .. 213

213(212). Front and middle tibia without outer apical spine or tooth, outer apical margin with gently

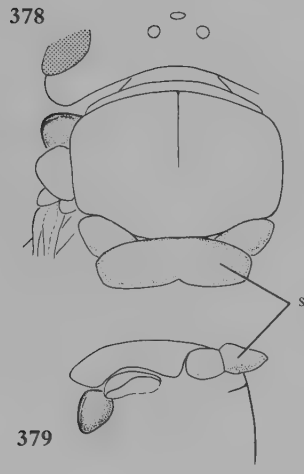
diente o careniforme (más baja en el macho que en la hembra); S3 del macho con una franja de largos pelos curvados hacia el medio (raro, tropical) ..... *Hoplostelis* [68]

— Escopa presente; mandíbula con base no protuberante; S3 del macho sin franja o con franja de pelos cortos no curvados hacia el medio 212

212(211). Escutelo sobresalido por encima de metanoto y propodeo [Fig. 379] en forma de lámina ancha, delgada, y trunca [Fig. 378]; suturas subantenales distintamente arqueadas hacia afuera [Fig. 382] (poco común) .... *Anthidiellum* [61]

— Escutelo redondeado o raramente bilobado posteriormente cuando visto de arriba [Fig. 380], a veces no sobresalido por encima de metanoto y propodeo [Fig. 381], no laminado aunque a veces con margen carenado; suturas subantenales usualmente no conspicuamente arqueadas 213

213(212). Tibias anterior y media sin diente o espina apical externa, margen apical externo proyectándose en una lámina



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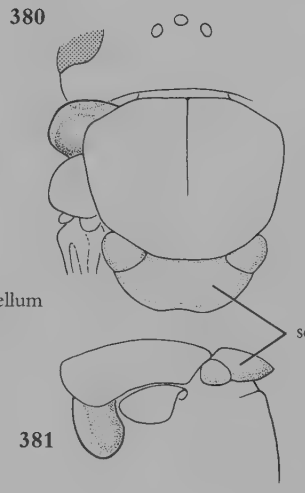

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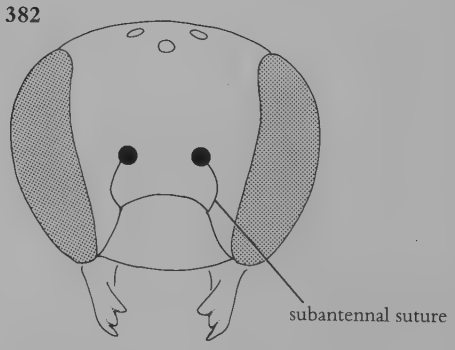

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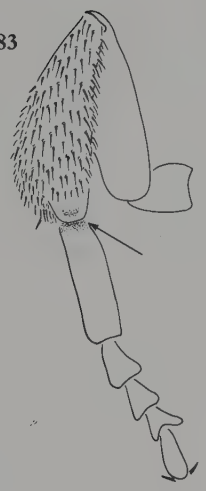

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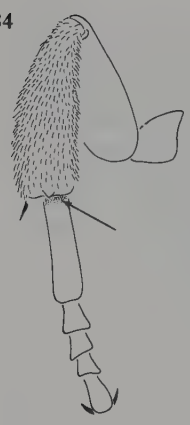


curved, transverse, projecting lamella, basal to which surface is shining and scooplike [Fig. 383]; apical margin of mandible oblique, about half as long as mandible (rare) ..... *Paranthidium* [71]

— Front and middle tibia with outer apical spine or tooth, sometimes weak and visible among hairs only in apical view, and without transverse lamella or shining concave area [Fig. 384]; apical margin of mandible variable 214

214(213). Anterior margin of scutum abruptly declivous, steeply sloping or vertical, in contrast to dorsal surface [Fig. 373]; posterior margin of metanotum, lateral to metanotal pit, with area or strip of short, white feltlike hair (rarely absent); mandible of female tridentate (Subgroups sometimes recognized as genera are characterized in "Notes.") ..... *Dianthidium* (part) [65]

— Anterior margin of scutum with surface a continuation of curvature of dorsal surface or at least not deviating from that curvature by more than 45° [Fig. 374]; metanotum without feltlike area or strip; mandible of female quadridentate (teeth sometimes low or badly worn; mandibles must be fully open to evaluate this character) 215

215(214). Propodeum without fovea behind spiracle; row of pits across upper margin of propodeum weak or absent 216

— Propodeum (except in *Epanthidium*) with fovea behind spiracle, margined by carina at least posteriorly

transversa, suavemente curva, basalmente a la cual la superficie es brillante y cóncava [Fig. 383]; mandíbula con margen apical oblicuo, aproximadamente la mitad del largo de la mandíbula (raro) ..... *Paranthidium* [71]

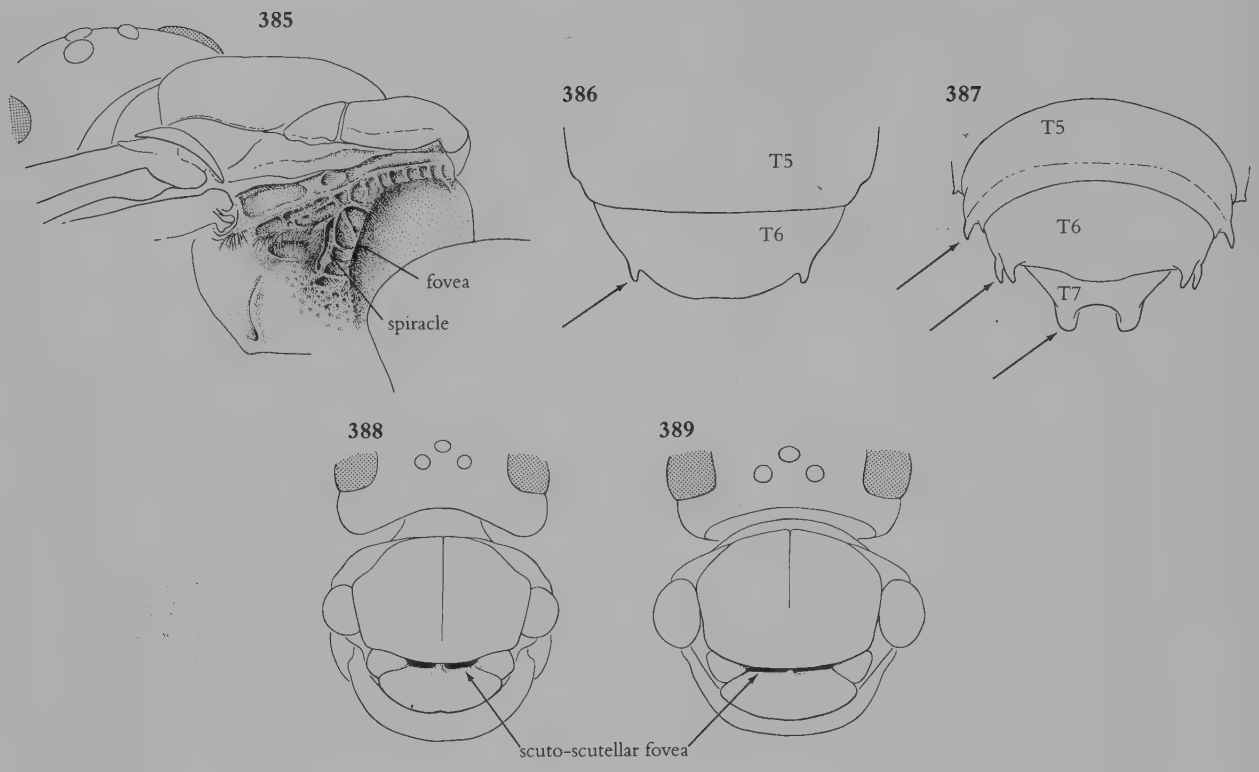
— Tibias anterior y media con un diente o espina apical externa, a veces débil y visible entre la pilosidad sólo en vista apical, y sin lámina transversa ni área brillante y cóncava [Fig. 384]; mandíbula con margen apical variable 214

214(213). Margen anterior del escudo abruptamente declive, con fuerte pendiente o vertical, destacado de la superficie dorsal [Fig. 373]; margen posterior del metanoto, lateralmente al hoyuelo metanotal, con un área o franja afelpada de pelitos cortos, blancos (raramente ausente); mandíbula de la hembra con tres dientes (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") ..... *Dianthidium* (parte) [65]

— Margen anterior del escudo continuando la curvatura de la superficie dorsal o al menos no desviándose de esa curvatura por más de 45° [Fig. 374]; metanoto sin área o franja afelpada; mandíbula de la hembra con cuatro dientes (dientes a veces bajos o muy gastados; las mandíbulas deben estar completamente abiertas para evaluar este carácter) 215

215(214). Propodeo sin fóvea detrás del espiráculo; margen superior del propodeo con hilera transversal de hoyuelos débil o ausente 216

— Propodeo (excepto *Epanthidium*) con fóvea detrás del espiráculo, marginado por una carena al menos posteri-



and sometimes divided into several pits [Fig. 385]; if fovea absent, a row of strong pits across upper margin of propodeum laterally 217

216(215). T6 of female [Fig. 386] and T5–T6 of male [Fig. 387] with strong lateral teeth; T7 of male strongly bilobed [Fig. 387] (Mexico) .... *Aztecanthidium* [64]

— T6 of female and T5–T6 of male without lateral teeth; T7 of male not strongly bilobed (Subgroups sometimes recognized as genera are characterized in "Notes.") ..... *Trachusa* (part) [74]

217(215). Each half of scuto-scutellar fovea about four times as wide as long [Fig. 388]; preoccipital carina strong, at least at side behind eye; body unusually coarsely punctate; T7 of male small, little exerted, simple or weakly bilobed (tropical) (Subgroups sometimes recognized as genera are characterized in "Notes.") ..... *Anthodioctes* [63]

— Each half of scuto-scutellar fovea much more than four times as wide as long, almost suture-like [Fig. 389]; preoccipital ridge not carinate; body not unormente y a veces dividido en varios hoyuelos [Fig. 385]; si fóvea ausente, entonces margen superior del propodeo con hilera transversa lateral de fuertes hoyuelos 217

216(215). T6 de la hembra [Fig. 386] y T5–T6 del macho [Fig. 387] con fuertes dientes laterales; T7 del macho fuertemente bilobado [Fig. 387] (México) .... *Aztecanthidium* [64]

— T6 de la hembra y T5–T6 del macho sin dientes laterales; T7 del macho no fuertemente bilobado (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") ..... *Trachusa* (parte) [74]

217(215). Cada mitad de la fóvea escudo-escutelar aproximadamente cuatro veces tan ancha como larga [Fig. 388]; carena preoccipital fuerte, al menos lateralmente detrás del ojo; cuerpo con puntuación inusitadamente fuerte; T7 del macho pequeño, poco exerto, simple o débilmente bilobado (tropical) (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") .. *Anthodioctes* [63]

— Fóvea escudo-escutelar casi en forma de sutura, cada mitad mucho más de cuatro veces tan ancha como larga [Fig. 389]; borde preoccipital no carenado; cuerpo no inusita-

usually coarsely punctate; T7 of male rather large, or at least broad, strongly exerted, deeply bilobed [Fig. 377] or trilobed.....218

218(217). Tegula widest well in front of middle; brow-like carina mesal to antennal socket absent or arising from middle of margin of socket and extending upward; T6 and S6 of female usually each with lateral tooth (rare, Mexico)..... *Epanthidium* [67]

— Tegula widest near middle; brow-like carina mesal to antennal socket separate from socket margin and extending below level of lower margin of socket [Fig. 376]; T6 and S6 of female without lateral teeth (rare, tropical) (Subgroups sometimes recognized as genera are characterized in "Notes.").....
.....*Hypanthidiodes* (part) [69]

219(203). Middle tibia with two spines at apex on outer side [Fig. 362] (for small specimens, examine in distal view); scopa of female absent (Megachilidae, Megachilinae, Anthidiini, part) (uncommon) .....
.....*Stelis* (part) [73]

— Middle tibia with one apical spine [Fig. 363]; scopa of female present.....220

220(219). Margin of stigma in first submarginal cell shorter than or about as long as width of stigma [Fig. 390]; claws of female cleft or with inner preapical tooth [as in Figs. 367 and 368]; clypeus and paraocular area of male usually yellow or cream-colored (Subgroups sometimes recognized as genera are characterized in "Notes.") (Megachilidae, Megachilinae, Anthidiini, part) ..... *Trachusa* (part) [74]

— Margin of stigma in first submarginal cell longer than width of stigma [Fig. 391]; claws of female simple or with basal tooth; clypeus and paraocular area not yellow or cream-colored.....221

221(220). Arolia absent [as in Fig. 367] (Subgroups sometimes recognized as genera are characterized in

damente puntuado; T7 del macho más bien grande, o al menos ancho, fuertemente exerto, profundamente bilobado [Fig. 377] o trilobado 218

218(217). Tégula con ancho máximo muy por delante de la mitad; alvéolo antenal con carena mesal en forma de ceja ausente o extendiéndose desde la mitad del margen del alvéolo hacia arriba; T6 y S6 de la hembra usualmente con diente lateral (raro, México) ..... *Epanthidium* [67]

— Tégula con ancho máximo cerca de la mitad; alvéolo antenal con carena mesal en forma de ceja, separada del margen alveolar y extendiéndose por debajo del nivel inferior del alvéolo [Fig. 376]; T6 y S6 de la hembra sin dientes laterales (raro, tropical) (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.")
..... *Hypanthidiodes* (parte) [69]

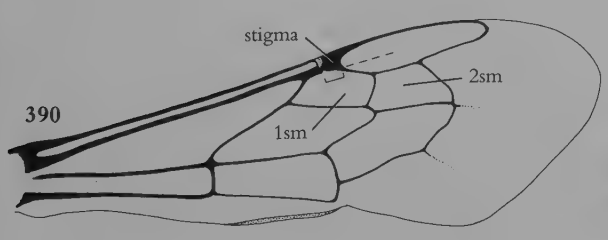
219(203). Tibia media con dos espinas externas en el ápice [Fig. 362] (ejemplares pequeños deben ser examinados en vista distal); escopa de la hembra ausente (Megachilidae, Megachilinae, Anthidiini, parte) (poco común).....
..... *Stelis* (parte) [73]

— Tibia media con una espina apical [Fig. 363]; escopa de la hembra presente..... 220

220(219). Margen del estigma sobre la primera celda submarginal más corto o aproximadamente tan largo como el ancho del estigma [Fig. 390]; uñas de la hembra bífidas o con diente preapical interno [como en Figs. 367 y 368]; clípeo y área paraocular del macho usualmente amarillo o color crema (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") (Megachilidae, Megachilinae, Anthidiini, parte).... *Trachusa* (parte) [74]

— Margen del estigma sobre la primera celda submarginal más largo que el ancho del estigma [Fig. 391]; uñas de la hembra simples o con diente basal; clípeo y área paraocular sin amarillo o color crema..... 221

221(220). Arolios ausentes [como en Fig. 367] (Subgrupos a veces reconocidos como géneros son caracterizados en



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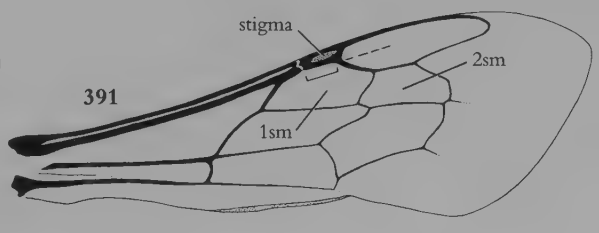

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"Notes.") (Megachilidae, Megachilinae, Megachilini, part) ..... *Megachile* [77]

— Arolia present [Fig. 368] (Megachilidae, Megachilinae, Osmiini, part) 222

222(221). Base of propodeum with narrow horizontal zone, set off by a carina from posterior surface and traversed by carinae breaking it into a series of large pits [Fig. 392]; anterior surface of T1 broadly concave and delimited by strong carina .... *Heriades* [80]

— Base of propodeum not separated by a carina from posterior surface and without a series of strong pits (if carina and pits evident, basal zone usually sloping and anterior surface of T1 not concave and delimited by strong carina) 223

223(222). Parapsidal lines punctiform or at most three times as long as broad [Fig. 393]; body usually metallic ..... *Osmia* [82]

— Parapsidal lines linear [Fig. 394]; body rarely metallic (although sometimes strongly so) 224

"Notes.") (Megachilidae, Megachilinae, Megachilini, parte) ..... *Megachile* [77]

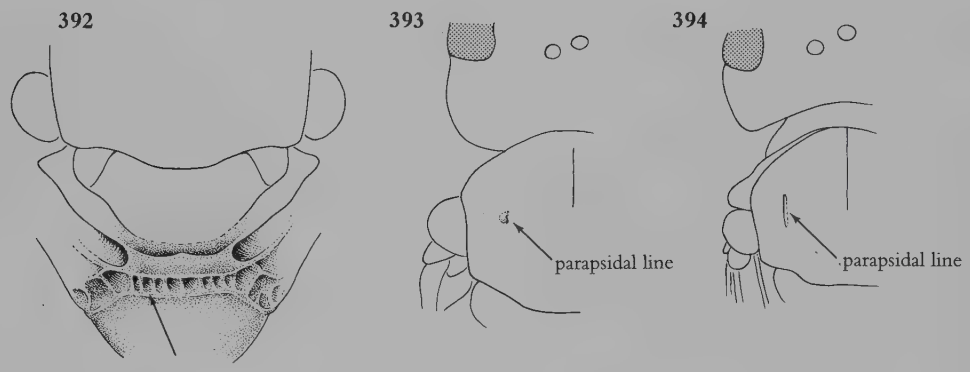
— Arolios presentes [Fig. 368] (Megachilidae, Megachilinae, Osmiini, parte) 222

222(221). Base del propodeo con una zona horizontal angosta separada de la superficie posterior por una carena y con una serie de fuertes hoyuelos separados por carenitas transversas [Fig. 392]; superficie anterior de T1 con una amplia concavidad delimitada por una fuerte carina ..... *Heriades* [80]

— Base del propodeo no separada de la superficie posterior por una carena y sin una serie de fuertes hoyuelos (si la carena y los hoyuelos fueran evidentes, la base es inclinada) y superficie anterior de T1 sin la concavidad delimitada por una fuerte carina 223

223(222). Lineas parapsidales puntiformes o cuanto más tres veces más largas que anchas [Fig. 393]; cuerpo usualmente metálico ..... *Osmia* [82]

— Lineas parapsidales lineares [Fig. 394]; cuerpo raramente metálico (aunque a veces fuertemente metálico) 224



224(223). Hind coxa with longitudinal carina (often weak) ventrally near mesal margin [Fig. 395] 225

— Hind coxa not carinate ventrally 226

225(224). Male with seven exposed metasomal terga; clypeus of female without median horn; metasoma of female red (rare, California) ..... *Xeroheriades* [84]

— Male with six exposed metasomal terga, T7 retracted and weakly sclerotized; clypeus of female with median apical spatulate horn [Fig. 396]; metasoma black (W) ..... *Protosmia* [83]

224(223). Coxa posterior ventralmente con carena longitudinal (frecuentemente débil) cerca de margen medio [Fig. 395] 225

— Coxa posterior no carenada ventralmente 226

225(224). Macho con siete tergos metasomales expuestos; clípeo de la hembra sin proceso medio; metasoma de la hembra rojo (raro, California) ..... *Xeroheriades* [84]

— Macho con seis tergos expuestos, T7 retraído y debilmente esclerotizado; clípeo de la hembra con un proceso apical medio espatulado [Fig. 396]; metasoma negro (W) ..... *Protosmia* [83]

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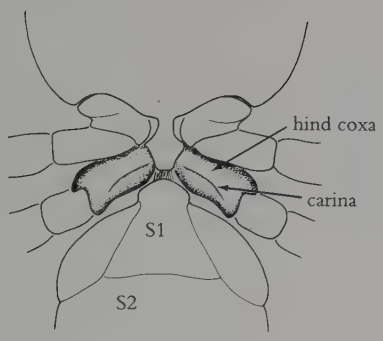

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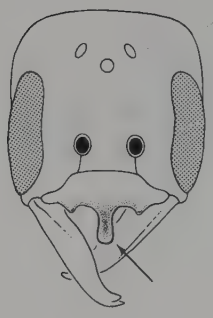

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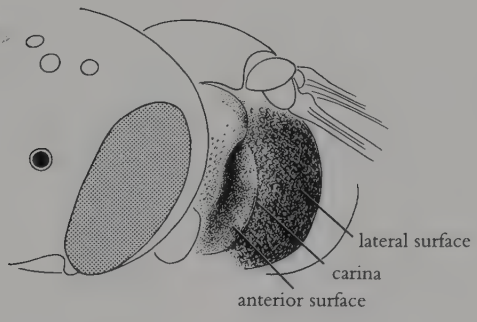

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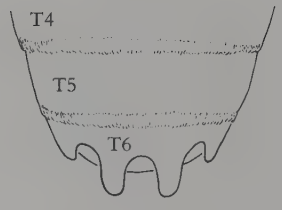


226(224). Mesepisternum with anterior surface separated from lateral surface, at least below, by weak carina [Fig. 397], anterior surface smooth and shining, lateral surface punctate; T6 of male four-toothed [Fig. 398] (mostly W)..... *Ashmeadiella* [78]

— Mesepisternum with lateral surface rounding onto anterior surface with no sharp boundary or sharp change in sculpturing; T6 of male not four-toothed 227

227(226). Body very slender, shortest distance between tegulae less than or equal to length of scutum..... ..... *Chelostoma* (part) [79]

— Body less slender, shortest distance between tegulae greater than length of scutum (Subgroups sometimes recognized as genera are characterized in "Notes.") ..... *Hoplitis* [81]

228(196). Inner subantennal suture little if any longer than diameter of antennal socket [Fig. 399]; anterior tentorial pit in lower end of outer subantennal suture;* S5 of female with distal margin convex; mar-

226(224). Mesepisterno con superficies anterior y lateral separadas, al menos abajo, por una carena débil [Fig. 397], superficie anterior lisa y brillante, superficie lateral puntuada; T6 del macho con cuatro dientes [Fig. 398] (mayormente W) ..... *Ashmeadiella* [78]

— Mesepisterno con unión de las superficies anterior y lateral redondeada, sin delimitación ni cambio de escultura marcados; T6 del macho no con cuatro dientes..... 227

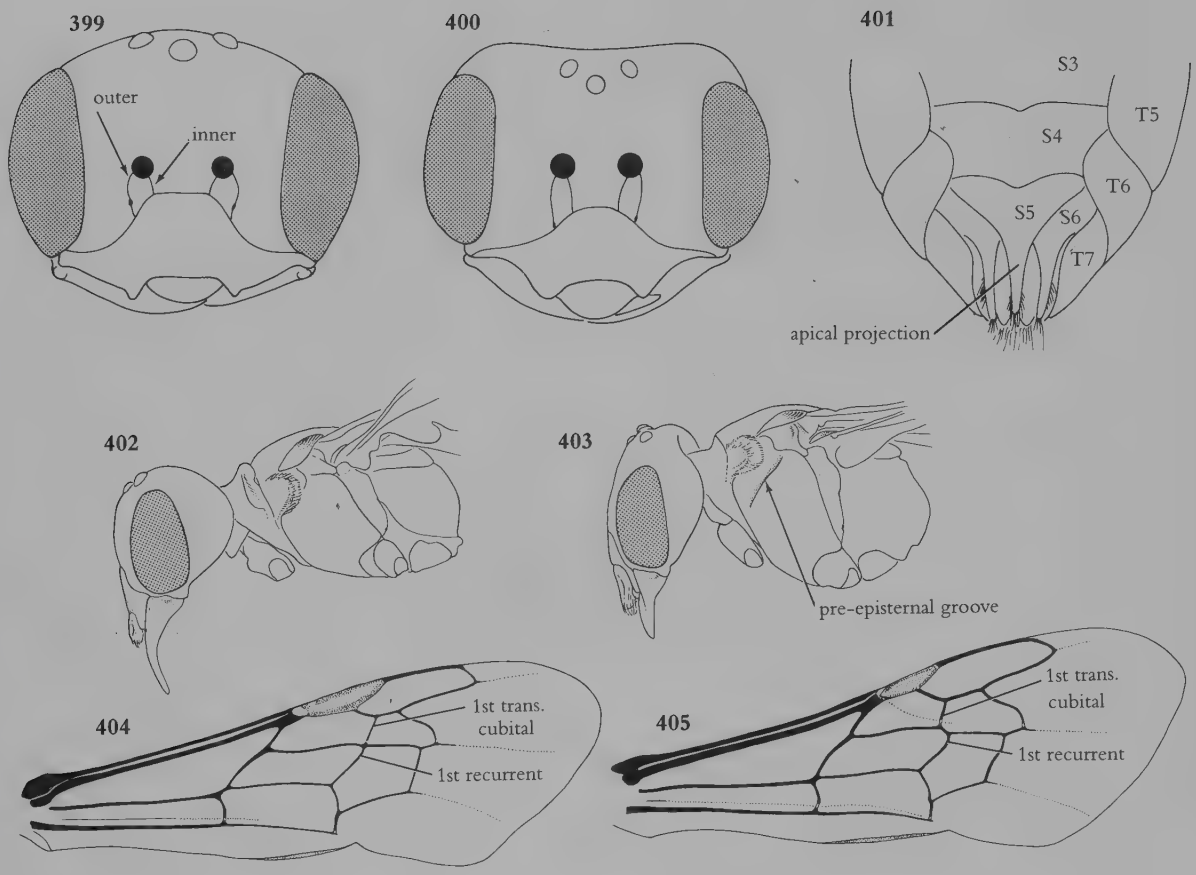
227(226). Cuerpo muy angosto, distancia mínima entre tégulas menor o igual al largo del escudo..... ..... *Chelostoma* (parte) [79]

— Cuerpo menos angosto, distancia mínima entre tégulas mayor que el largo del escudo (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.")..... ..... *Hoplitis* [81]

228(196). Sutura subantenal interna poco o nada más larga que el diámetro del alvéolo antenal [Fig. 399]; hoyuelo tentorial anterior ubicado en la parte inferior de la sutura subantenal externa;* S5 de la hembra con margen distal

*This is a difficult character because the pit sometimes invades the junction of the epistomal and outer subantennal sutures. However, the distinction is usually evident.

*Este carácter es difícil de apreciar pues a veces el hoyuelo se extiende a la unión de las suturas subantenal externa y epistomal. Sin embargo la distinción es usualmente evidente.



gin of S5 of male usually with well-developed median apical projection and of S4 usually with median apical convexity or projection [Fig. 401] (Subgroups sometimes recognized as genera are characterized in "Notes.") ..... *Calliopsis* [13]

— Inner subantennal suture usually much longer than diameter of antennal socket [Fig. 400]; anterior tentorial pit at junction of outer subantennal suture and epistomal suture or in latter suture below junction (outer subantennal suture absent in some *Heterosarus* and *Pseudopanurgus*); S5 of female with distal margin straight or concave; S4 and S5 of male without apical projections 229

229(228). Pre-episternal groove completely absent [Fig. 402]; first recurrent vein meeting first transverse cubital or nearly so [Fig. 404]; S6 of male with thickened median apical truncate or emarginate projection (not tropical)..... *Panurginus* [16]

convexo; margen distal de S5 del macho usualmente con proyección media apical bien desarrollada y margen distal de S4 usualmente con pròyección o convexidad apical media [Fig. 401] (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") .. *Calliopsis* [13]

— Sutura subantenal interna usualmente mucho más larga que el diámetro del alvéolo antenal [Fig. 400]; hoyuelo tentorial anterior ubicado en la unión de las suturas subantenal externa y epistomal o por debajo de dicha unión, en la sutura epistomal (sutura subantenal externa ausente en algunos *Heterosarus* y *Pseudopanurgus*); S5 de la hembra con margen distal recto o cóncavo; S4 y S5 del macho sin proyecciones apicales 229

229(228). Surco pre-episternal completamente ausente [Fig. 402]; vena primera recurrente uniéndose a la primera transversa cubital o casi [Fig. 404]; S6 del macho con proyección apical media engrosada trunca o emarginada (no tropical) ..... *Panurginus* [16]

— Pre-episternal groove present [Fig. 403] (sometimes very weak), directed anteroventrally from upper end, in some minute species visible only at upper end (and hair must be removed to see it); first recurrent vein usually considerably distal to first transverse cubital [Fig. 405]; S6 of male without thickened apical projection, margin thin and emarginate or cleft 230

230(229). Body dark metallic blue at least on dorsum of head and thorax; clypeus of male 2.7 to over 3 times as broad as long (rare, Mexico to Arizona) ..... *Xenopanurgus* [20]

— Body nonmetallic or essentially so, black or partly red; clypeus of male not over twice as broad as long 231

231(230). Propodeal triangle with short hairs at least laterally, densely punctured or finely reticulate [Fig. 406] 232

— Propodeal triangle glabrous [Fig. 407], dorsal surface usually striate or finely areolate but densely punctured in some minute species 233

232(231). Head and thorax with yellow areas; propodeum entirely densely punctate [Fig. 406]; labial palpus with first segment about as long as segments 2–4 combined ..... *Metapsaenythia* [15]

— Head and thorax black except limited yellow on clypeus of male; propodeum impunctate along lateral margin of triangle, dorsal surface of triangle finely reticulate [Fig. 408]; labial palpus with first segment much shorter than segments 2–4 combined (rare, eastern and central U.S.A.).. *Anthemurgus* [12]

— Surco pre-episternal presente [Fig. 403] (a veces débil), dirigido anteroventralmente desde el extremo superior, en algunas especies diminutas visible sólo en el extremo superior (debe removerse el pelo para verlo); usualmente primera vena recurrente considerablemente distal a la primera transversa cubital [Fig. 405]; S6 del macho sin proyección apical engrosada, margen delgado y emarginado o partido 230

230(229). Cuerpo azul metálico oscuro, al menos sobre el dorso de cabeza y tórax; clípeo del macho 2,7 veces a más de 3 veces más ancho que largo (raro, México hasta Arizona) ..... *Xenopanurgus* [20]

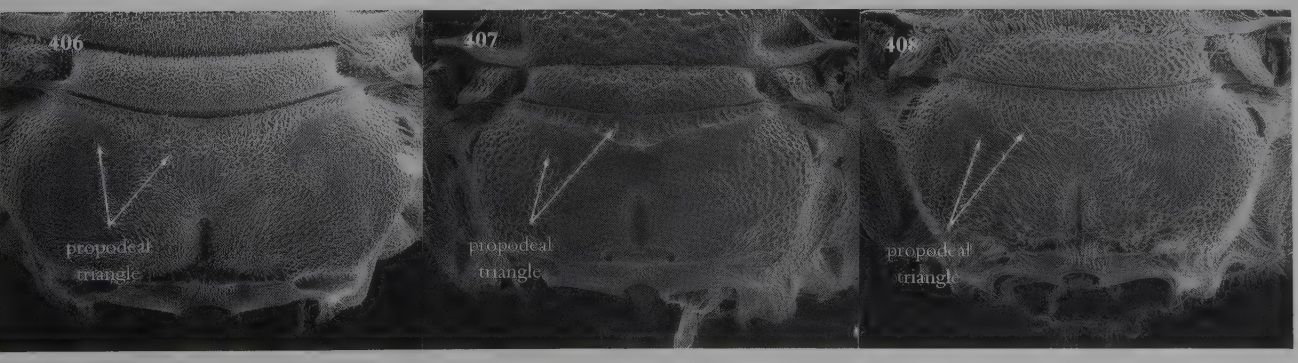
— Cuerpo no metálico o muy débilmente metálico, negro o parcialmente rojo; clípeo del macho no más de dos veces tan ancho como largo 231

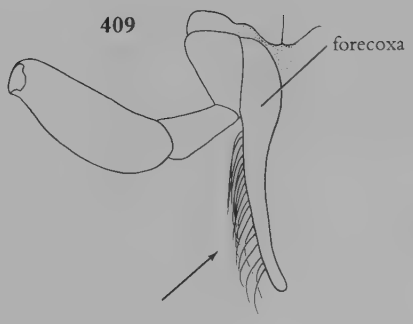
231(230). Triángulo propodeal con pelos cortos al menos lateralmente, densamente puntuado o finamente reticulado [Fig. 406] 232

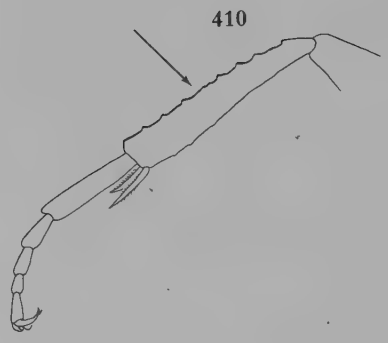
— Triángulo propodeal glabro [Fig. 407], superficie dorsal usualmente estriada o finamente areolada, pero densamente puntuado en algunas especies muy pequeñas.. 233

232(231). Cabeza y tórax con áreas amarillas; propodeo entera y densamente puntuado [Fig. 406]; palpo labial con el primer segmento casi tan largo como los segmentos 2–4 juntos ..... *Metapsaenythia* [15]

— Cabeza y tórax negros excepto por algo de amarillo en el clípeo del macho; propodeo no puntuado a lo largo del margen lateral del triángulo, superficie dorsal del triángulo finamente reticulada [Fig. 408]; palpo labial con el primer segmento mucho más corto que los segmentos 2–4 juntos (raro, este y centro de E.U.A.) ..... *Anthemurgus* [12]







233(231). Forecoxa of female with strong, hairy, apical spine [Fig. 409]; anterior and lateral surfaces of mesepisternum separated by strong right angle; hind tibia of male with upper margin carinate but not toothed ..... *Pseudopanurgus* [19]

— Forecoxa without apical spine; lateral surface of mesepisternum rounded onto anterior surface; hind tibia of male with upper marginal carina usually toothed or undulate [Fig. 410] (Subgroups sometimes recognized as genera are characterized in "Notes.") .....*Heterosarus* [14]

233(231). Coxa anterior de la hembra con una fuerte espina apical pilosa [Fig. 409]; superficies anterior y lateral del mesepisterno unidas en ángulo recto bien marcado; tibia posterior del macho con margen superior carenado pero no dentado..... *Pseudopanurgus* [19]

— Coxa anterior sin espina apical; superficies anterior y lateral del mesepisterno unidas en suave curva; tibia posterior del macho con margen superior carenado y dentado o ondulado [Fig. 410] (Subgrupos a veces reconocidos como géneros son caracterizados en "Notes.") ....*Heterosarus* [14]

Key to the Families of North and Central America

Clave para las Familias de América del Norte y Central

a. First two segments of labial palpus long, flattened, and sheathlike [Figs. 6 and 414]; remaining two segments small, short, often directed laterad, not sheathlike, rarely absent or third flat and not directed laterad; volsella absent or greatly reduced, rarely distinct.....b

— First two segments of labial palpus not flattened and sheathlike, similar in form to third and fourth segments, or sometimes first segment much elongated and somewhat sheathlike [Figs. 8 and 416]; volsella usually well developed [Fig. 20].....d

b(a). Labrum longer than broad, at base widened to broad articulation with clypeus [Fig. 357]; scopa, when present, on metasomal sterna [Fig. 23]; two submarginal cells, usually about equal in length [Fig. 53]... ..... Megachilidae

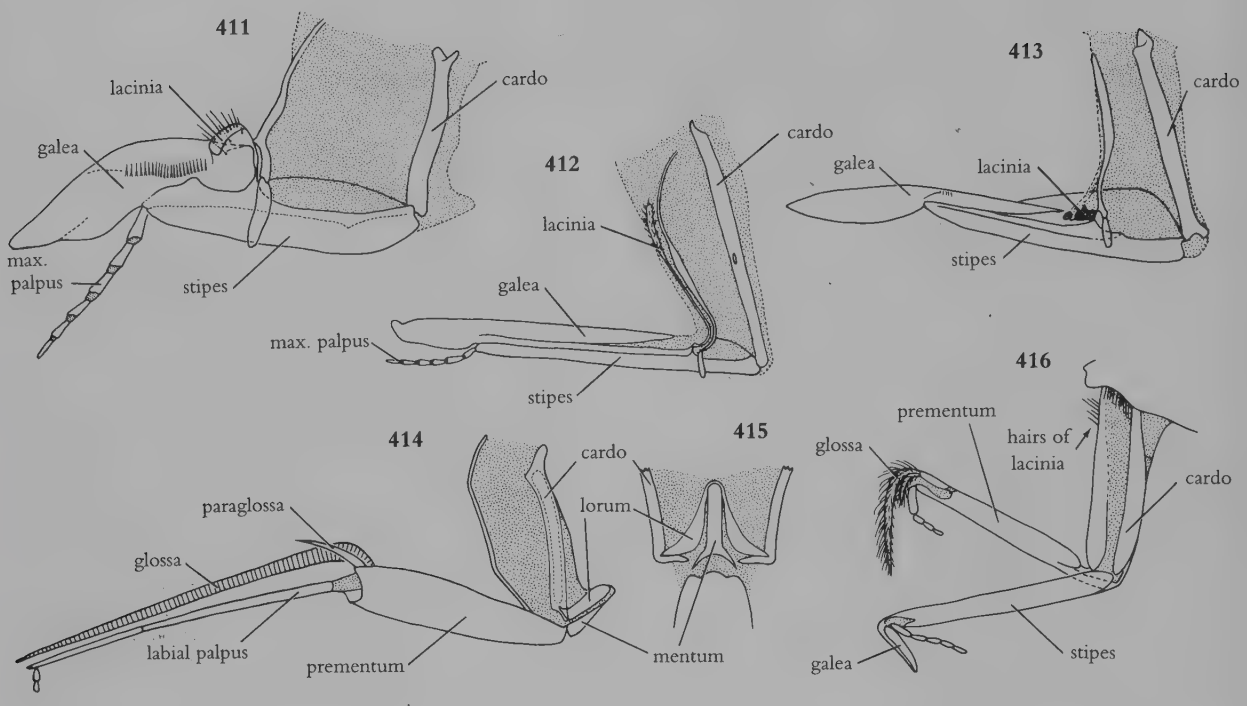
— Labrum broader than long [Fig. 356] or, if longer than broad, then narrowed basally to short articulation with clypeus [Fig. 317]; scopa, when present, on hind legs (principally the tibia); usually three

a. Palpo labial con los dos primeros segmentos largos, aplanados, en forma de vaina [Figs. 6 y 414]; los dos segmentos restantes pequeños, cortos, con frecuencia dirigidos lateralmente, no en forma de vaina, raramente ausentes o el tercero plano y no dirigido lateralmente; volsela ausente o sumamente reducida..... b

— Palpo labial con los dos primeros segmentos no aplanados y en forma de vaina, similares en forma al tercer y cuarto segmentos, o a veces primer segmento muy alargado y algo aplanado [Figs. 8 y 416]; volsela usualmente bien desarrollada [Fig. 20]..... d

b(a). Labro más largo que ancho, ensanchado en la base formando una amplia articulación con el clípeo [Fig. 357]; escopa, cuando presente, en los esternos del metasoma [Fig. 23]; dos celdas submarginales, usualmente más o menos del mismo largo [Fig. 53] ..... Megachilidae

— Labro más ancho que largo [Fig. 356] o, si es más largo que ancho, entonces angostado basalmente formando articulación corta con el clípeo [Fig. 317]; escopa, cuando presente, en las patas posteriores (principalmente la tibia);



submarginal cells [Fig. 52]; if two submarginal cells, often with first much longer than second or veins weakened; sometimes only one submarginal cell... c

c(b). Scopa, when present, forming fringe around corbicula on outer surface of hind tibia [Fig. 67]; inner apical margin of hind tibia of females (except for parasites, queens, and workers of some minute species) with comb of short, stiff setae (rastellum); pygidial plate completely absent ..... Apidae

— Scopa brushlike when present, tibial corbicula absent [Fig. 68]; inner apical margin of hind tibia without comb of short setae; pygidial plate present in most females and many males [Fig. 320] .... Anthophoridae

d(a). Glossa broadly subtruncate, emarginate, or bilobed [Fig. 8] ..... Colletidae

— Glossa pointed [Figs. 6 and 416] ..... e

e(d). Lacinia a scalelike lobe with hairs, near base of galea [Fig. 411]; mentum and lorum together forming a

usualmente tres celdas submarginales [Fig. 52]; a veces sólo una o dos celdas submarginales; si dos celdas submarginales, la primera frecuentemente mucho más larga que la segunda o las venas débiles..... c

c(b). Escopa, cuando presente, formando una orla alrededor de la corbícula en la superficiè externa de la tibia posterior [Fig. 67]; margen apical interno de la tibia posterior de las hembras (excepto parásitos, reinas, y obreras de algunas especies pequeñas) con un peine de setas cortas, rígidas (rastellum); placa pigidial completamente ausente .... Apidae

— Escopa, cuando presente, como cepillo, no delimitando una corbícula tibial [Fig. 68]; margen apical interno de la tibia posterior sin peine de setas cortas; placa pigidial presente en la mayoría de las hembras y en muchos machos [Fig. 320]..... Anthophoridae

d(a). Glosa anchamente subtrunca, emarginada, o bilobada [Fig. 8]..... Colletidae

— Glosa aguzada [Figs. 6 y 416] ..... e

e(d). Lacinia como lóbulo piloso, en forma de conchuela, cerca de la base de la gálea [Fig. 411]; mentum y lorum

lobe projecting behind labiomaxillary tube (= basal part of proboscis) [as in Fig. 414]; lorum at least partly sclerotized and having shape other than mere sclerotization of nearly flat membrane [Figs. 8 and 415] ..... f

— Lacinia inconspicuous or displaced, not easily identifiable [Figs. 412 and 413]; mentum and lorum not forming a lobe projecting behind labiomaxillary tube [Fig. 416]; mentum membranous or membrane partly sclerotized; lorum largely membranous or membrane largely sclerotized but flat, occupying space between cardines ..... g

f(e). Facial fovea present in females and some males [Fig. 111]; almost always two subantennal sutures on each side [Fig. 111, 399, and 400]; lorum more or less platelike but produced posteriorly in middle for reception of mentum [Fig. 8] ..... Andrenidae

— Facial fovea absent [Fig. 158]; one subantennal suture [Figs. 157 and 158]; lorum slender, V-shaped or Y-shaped [as in Fig. 415] ..... Melittidae

g(e). Lacinia small hairless sclerite near base of galea but hidden between expanded stipites [Fig. 413]; stigma virtually absent [Fig. 192]; first flagellar segment as long as scape; two subantennal sutures on each side [Figs. 111, 399, and 400] ..... Oxaeidae

— Lacinia disassociated from rest of maxilla, represented by small hairy lobe on anterior face of labiomaxillary tube [Fig. 412]; stigma well developed [Fig. 181]; first flagellar segment much shorter than scape; one subantennal suture on each side [Figs. 157 and 158] ..... Halictidae

formando juntos un lóbulo que se proyecta por detrás del tubo labiomaxilar (parte basal de la proboscis) [como en Fig. 414]; lorum al menos parcialmente esclerotizado y con forma diferente a una esclerotización simple de una membrana casi plana [Figs. 8 y 415] ..... f

— Lacinia inconspicua o desplazada, no fácil de identificar [Figs. 412 y 413]; mentum y lorum no formando un lóbulo proyectado por detrás del tubo labiomaxilar; mentum membranoso o la membrana parcialmente esclerotizada; lorum mayormente membranoso o la membrana mayormente esclerotizada pero plana, ocupando el espacio entre las cardinas ..... g

f(e). Fóvea facial presente en hembras y algunos machos [Fig. 111]; casi siempre dos suturas subantenales a cada lado [Figs. 111, 399, y 400]; lorum más o menos en forma de placa, pero prolongado posteriormente en el medio para recibir el mentum [Fig. 8] ..... Andrenidae

— Fóvea facial ausente [Fig. 158]; una sutura subantenal [Figs. 157 y 158]; lorum delgado, en forma de V o de Y [como en Fig. 415] ..... Melittidae

g(e). Lacinia como esclerito glabro cerca de la base de la gálea pero oculta entre los estipes expandidos [Fig. 413]; estigma virtualmente ausente [Fig. 192]; primer segmento del flagelo tan largo como el escapo; dos suturas subantenales a cada lado ..... Oxaeidae

— Lacinia disociada del resto de la maxila, representada por un pequeño lóbulo piloso en la superficie anterior del tubo labiomaxilar [Fig. 412]; estigma bien desarrollado [Fig. 181]; primer segmento del flagelo mucho más corto que el escapo; una sutura subantenal a cada lado ..... Halictidae

Guide to the Genera of Each Family

Guía para los Géneros de Cada Familia

Persons familiar with bees may recognize many specimens by general appearance as belonging to a certain family. For example, appearance (sometimes deceptive) may indicate that a specimen is a halictid or a megachilid. Others may have determined the family using "Key to the Families." In such cases, the keys below will guide the user to the genus or to a couplet in "Key to the Genera," thus bypassing sections of that key on other families. This is a more efficient mode of identification if one knows the family in advance. A key to all the North and Central American genera of any family can be assembled using this section, "Guide to the Genera," plus the indicated sections of "Key to the Genera."

Personas que están familiarizadas con las abejas pueden reconocer en muchos casos a qué familia pertenecen por su apariencia general. Por ejemplo, la apariencia (a veces engañadora) de un ejemplar puede indicar que es un halíctido o un megachílido. Otras personas pueden haber determinado la familia usando "Clave para las Familias." En estos casos las claves que siguen guiarán al usuario al género o una alternativa de "Clave para los Géneros," evitando así las secciones de esta última clave sobre otras familias. Este es un modo más eficiente de identificación si se conoce la familia de antemano. Una clave para todos los géneros de América del Norte y Central de cualquier familia puede ser armada usando esta sección, "Guía para los Géneros," más las secciones que se indican de "Clave para los Géneros."

Colletidae

a. With three submarginal cells [Fig. 52]; body more robust and usually conspicuously hairy [Fig. 417].. .....b

Colletidae

a. Con tres celdas submarginales [Fig. 52]; cuerpo más robusto y usualmente conspicuamente piloso [Fig. 417]... b

— With two submarginal cells [Fig. 53]; body slender and hairs inconspicuous [Fig. 420] ..... go to couplet 177

b(a). Body extraordinarily coarsely punctate; certain metasomal terga with yellow or white integumental bands; preoccipital ridge developed as strong lamella ..... *Eulonchopria* [2]

— Body not extraordinarily coarsely punctate; metasomal terga ordinarily without yellow or white integumental bands; preoccipital ridge not lamellate c

c(b). Second recurrent vein distinctly arcuate distad in its posterior portion [Fig. 79] ..... *Colletes* [1]

— Second recurrent vein not arcuate distad in posterior portion [as in Fig. 80] ..... go to couplet 15

Andrenidae

a. Apex of marginal cell pointed on or within one or two vein widths of wing margin [Fig. 80]; scopa well developed on hind trochanter and femur [Fig. 68]; facial fovea of female broad, covered with minute hairs [Fig. 82] ..... go to couplet 43

— Apex of marginal cell truncate [Fig. 88] (sometimes obliquely, so that apex is well separated from wing margin); scopa principally developed on hind tibia [as in Fig. 345]; facial fovea of female narrow and hairless ..... b

b(a). With three submarginal cells [Fig. 52] c

— With two submarginal cells [Fig. 53] ..... d

c(b). Second submarginal cell minute, triangular, petiolate on side toward marginal cell [Fig. 190] ..... *Perdita* (part) [17]

— Second submarginal cell quadrate or rarely triangular but not petiolate [Fig. 88] ..... *Protandrena* [18]

d(b). Marginal cell distal to stigma on costa little if any longer than stigma *and* second submarginal cell less than two-thirds as long as first [Fig. 306] (see footnote to couplet 173) ..... *Perdita* (part) [17]

— Marginal cell distal to stigma on costa longer than stigma or, *if not,* then second submarginal cell two-

— Con dos celdas submarginales [Fig. 53]; cuerpo más delgado y pilosidad inconspicua [Fig. 420] ..... ir a 177

b(a). Cuerpo con puntos extraordinariamente fuertes; integumento de algunos tergos del metasoma con bandas amarillas o blancas; borde preoccipital en forma de una fuerte lámina ..... *Eulonchopria* [2]

— Cuerpo con puntos no especialmente fuertes; integumento del metasoma comúnmente sin bandas amarillas o blancas; borde preoccipital no laminado c

c(b). Porción posterior de la segunda vena recurrente distintamente arqueada distalmente [Fig. 79] ..... *Colletes* [1]

— Porción posterior de la segunda vena recurrente no arqueada hacia afuera [como en Fig. 80] ..... ir a 15

Andrenidae

a. Apice de la celda marginal agudo, sobre el borde del ala o separado del borde por una o dos veces el grosor de una vena [Fig. 80]; escopa bien desarrollada en el trocánter y el fémur posteriores [Fig. 68]; hembra con fóveas faciales anchas, cubiertas por pelitos muy pequeños [Fig. 82] ..... ir a 43

— Apice de la celda marginal truncado [Fig. 88] (a veces oblicuamente, de modo que el ápice está bien separado del borde del ala); escopa desarrollada principalmente en la tibia posterior [como en Fig. 345]; hembra con fóveas faciales angostas y sin pelos ..... b

b(a). Con tres celdas submarginales [Fig. 52] c

— Con dos celdas submarginales [Fig. 53] ..... d

c(b). Segunda celda submarginal muy pequeña, triangular, peciolada hacia la celda marginal [Fig. 190] ..... *Perdita* (parte) [17]

— Segunda celda submarginal cuadrada o raramente triangular, pero nunca peciolada [Fig. 88] ..... *Protandrena* [18]

d(b). Celda marginal sobre el margen costal, distalmente al estigma, poco o nada más larga que éste *y* segunda celda submarginal menos de dos tercios del largo de la primera [Fig. 306] (ver nota en la alternativa 173) ..... *Perdita* (parte) [17]

— Celda marginal sobre el margen costal, distalmente al es-

thirds as long as first or longer [Figs. 404 and 405] ..... go to couplet 228

Oxaeidae

..... go to couplet 94

Halictidae

a. First and third submarginal cells subequal in length, much longer than second [Fig. 84]; apex of marginal cell bluntly rounded [Fig. 84]; pre-episternal groove absent or nearly so below level of scrobal groove [Fig. 58] ..... go to couplet 36

— Third submarginal cell shorter than first, usually much shorter [Fig. 86], or with only two submarginal cells; apex of marginal cell pointed, narrowly rounded, or minutely truncate [Fig. 86]; pre-episternal groove present below scrobal groove [Fig. 59], sometimes weak in *Dufourea* and its relatives ..... b

b(a). Middle tibial spur coarsely serrate with 8 to 10 large teeth [Fig. 107] ..... *Xeralictus* [56]

— Middle tibial spur finely pectinate or ciliate, appearing simple under low magnification [Fig. 108] c

c(b). Clypeus not much longer than labrum, the latter broadly rounded or truncate, without apical process; T5 of female without longitudinal median zone or triangle of minute punctures and dense, short hairs dividing prepygidial fimbria ..... d

— Clypeus much longer than disc of labrum; labrum in female usually with long, pointed median apical process margined by coarse bristles; T5 of female with longitudinal median zone or triangle of minute punctures and dense, short hairs dividing prepygidial fimbria [Fig. 131], except in parasitic genera ..... e

d(c). With three submarginal cells [Fig. 52] ..... go to couplet 39

tigma, más larga que éste o, *si no,* entonces segunda celda submarginal dos tercios o más del largo de la primera [Figs. 403 y 404] ..... ir a 228

Oxaeidae

.....ir a 94

Halictidae

a. Primera y tercera celdas submarginales subiguales en largo, mucho más largas que la segunda [Fig. 84]; ápice de la celda marginal anchamente redondeado [Fig. 84]; surco pre-episternal ausente o casi ausente por debajo del nivel del surco escrobal [Fig. 58] .....ir a 36

— Tercera celda submarginal más corta que la primera, usualmente mucho más corta [Fig. 86], o sólo con dos celdas submarginales; ápice de la celda marginal agudo, angostamente redondeado, o brevemente trunco [Fig. 86]; surco pre-episternal presente por debajo del nivel del surco escrobal [Fig. 59], a veces débil en *Dufourea* y géneros relacionados ..... b

b(a). Espolones de las tibias medias fuertemente aserrados, con 8 a 10 grandes dientes [Fig. 107] .....*Xeralictus* [56]

— Espolones de las tibias medias finamente pectinados, vistos con bajos aumentos parecen simples [Fig. 108] c

c(b). Clípeo no mucho más largo que el labro, este último anchamente redondeado o trunco, sin proceso apical; T5 de la hembra sin área longitudinal media o triángulo con puntuación fina y pelos cortos y densos que dividen la fimbria prepigidial ..... d

— Clípeo mucho más largo que el disco del labro; labro en la hembra usualmente con un proceso apical medio en punta, bordeado de fuertes setas; T5 de la hembra con un área longitudinal media o triángulo con puntuación fina y pelos cortos y densos que dividen la fimbria prepigidial [Fig. 131], excepto en los géneros parásitos .....e

d(c). Con tres celdas submarginales [Fig. 52] .....ir a 39

— With two submarginal cells [Fig. 53] ..... go to couplet 188

e(c). With three submarginal cells [Fig. 52] ..... go to couplet 48

— With two submarginal cells [Fig. 53] ..... go to couplet 185

Melittidae

a. With three submarginal cells [as in Fig. 52] ..... *Melitta* [59]

— With two submarginal cells [as in Fig. 53] ..... go to couplet 194

Megachilidae

a. Jugal lobe of hind wing about three-fourths as long as vannal lobe [as in Fig. 350]; tibiae coarsely spiculate on outer surfaces, at least in female, the spicules being blunt and not ending in hairs [Fig. 348]; pygidial plate present in male, represented by large flattened spine in female ..... *Lithurge* [60]

— Jugal lobe of hind wing half as long as vannal lobe or less [Fig. 349]; tibiae not spiculate or spicules ending in hairs; pygidial plate absent.....b

b(a). Axilla produced posteriorly into angle or spine lateral to scutellum [Fig. 217] ..... go to couplet 182

— Axilla not produced..... go to couplet 203

Anthophoridae

a. With three submarginal cells [Fig. 52] .....b

— With two submarginal cells [Fig. 53] .....k

b(a). Marginal cell with apex pointed, on wing margin or within two vein widths of margin [Figs. 83–86] c

— Marginal cell with apex rounded, truncate, or, if pointed, bent away from costa, so that apex is three or more vein widths from wing margin [Figs. 87–90] .....d

— Con dos celdas submarginales [Fig. 53] ..... ir a 188

e(c). Con tres celdas submarginales [Fig. 52] .....ir a 48

— Con dos celdas submarginales [Fig. 53] ..... ir a 185

Melittidae

a. Con tres celdas submarginales [Fig. 52] ..... *Melitta* [59]

— Con dos celdas submarginales [Fig. 53] ..... ir a 194

Megachilidae

a. Lóbulo yugal del ala posterior aproximadamente tres cuartos del largo del lóbulo vanal [como en Fig. 350]; superficie externa de las tibias, al menos en la hembra, con numerosas espículas gruesas carentes de pelos [Fig. 348]; placa pigidial presente en el macho, representada por una grande espina aplanada en la hembra ..... *Lithurge* [60]

— Lóbulo yugal del ala posterior la mitad del largo del lóbulo vanal o menos [Fig. 349]; tibias no espiculadas, o espículas terminadas en pelos; placa pigidial ausente..... b

b(a). Axila proyectada posteriormente en un ángulo o espina lateral al escutelo [Fig. 217]..... ir a 182

— Axila no proyectada ..... ir a 203

Anthophoridae

a. Con tres celdas submarginales [Fig. 52] ..... b

— Con dos celdas submarginales [Fig. 53] ..... k

b(a). Celda marginal con ápice en punta, ápice junto al margen costal del ala o, si alejado, no por más de dos veces el grosor de una vena [Figs. 83–86].....c

— Celda marginal con el ápice redondeado, trunco, o, si en punta, entonces alejado del margen costal del ala por tres o más veces el grosor de una vena [Figs. 87–90] ..... d

c(b). Jugal lobe of hind wing small, less than one-third as long as vannal lobe [Fig. 91]; scopa absent ..... go to couplet 28

— Jugal lobe of hind wing over one-third as long as vannal lobe [Fig. 114]; scopa of female present on hind tibia ..... *Ceratina* (part) [149]

d(b). Posterior basitarsus longer than tibia; second submarginal cell greatly narrowed toward marginal cell [Fig. 191]; stigma absent [Fig. 191] ..... *Xylocopa* [150]

— Posterior basitarsus shorter than tibia; second submarginal cell quadrate, not greatly narrowed toward marginal cell; stigma present (minute in *Acanthopus*) ..... e

e(d). Middle tibial spur notched [Fig. 194], bifid, or multidentate [Fig. 195] at apex; scopa absent ..... go to couplet 96

— Middle tibial spur pointed [Fig. 196], not notched or bifid but with a preapical shoulder in *Epicharis;* scopa present or absent ..... f

f(e). Metasoma of female tapering (as in *Coelioxys*) [Fig. 203], S6 elongate, tapering to acute point beyond apex of T6, forming tube containing sting; T6 of female twice as long as basal width; male without hind tibial spurs, with dense brush on T7 ..... *Coelioxoides* [132]

— Metasoma not tapering as in *Coelioxys,* S6 not so elongate, usually not acutely pointed; hind tibial spurs present ..... g

g(f). Arolia absent [Fig. 204] ..... go to couplet 102

— Arolia present [Fig. 205] ..... h

h(g). Scutellum strongly convex in profile, posterior margin (behind spines or tubercles when these are present) at nearly right angles to anterior part [Fig. 214]; scutellar surface sometimes bilobed, bituberculate, or bispinose [Fig. 216]; metanotum declivous like propodeal profile [Fig. 214] ..... go to couplet 109

— Scutellum less strongly convex, posterior third at an angle of 110° or more to anterior part [Fig. 215]; scutellar surface not bituberculate; metanotum often more nearly horizontal, as is frequently base of propodeum i

c(b). Lóbulo yugal del ala posterior pequeño, menos de un tercio del largo del lóbulo vanal [Fig. 91]; escopa ausente ..... ir a 28

— Lóbulo yugal del ala posterior más de un tercio del largo del lóbulo vanal [Fig. 114]; escopa de la hembra presente en la tibia posterior ..... *Ceratina* (parte) [149]

d(b). Basitarso posterior más largo que la tibia; segunda celda submarginal muy angostada hacia la celda marginal [Fig. 191]; estigma ausente [Fig. 191] ..... *Xylocopa* [150]

— Basitarso posterior más corto que la tibia; segunda celda submarginal cuadrada, no muy angostada hacia la celda marginal; estigma presente (muy pequeño en *Acanthopus*) ..... e

e(d). Espolón tibial medio con muesca apical [Fig. 194], bífido, o multidentado [Fig. 195]; escopa ausente ..... ir a 96

— Espolón tibial medio aguzado [Fig. 196], no bífido ni con muesca, aunque con ángulo romo preapical en *Epicharis;* con o sin escopa ..... f

f(e). Hembra con metasoma cónico (como en *Coelioxys*) [Fig. 203], S6 alargado, angostándose y terminando en punta más allá del ápice de T6, formando un tubo que contiene el aguijón; hembra con T6 dos veces más largo que el ancho basal; macho sin espolones tibiales posteriores, T7 terminado en un cepillo denso ..... *Coelioxoides* [132]

— Metasoma no cónico como en *Coelioxys,* S6 no así alargado, usualmente no aguzado; espolones tibiales posteriores presentes ..... g

g(f). Arolios ausentes [Fig. 204] ..... ir a 102

— Arolios presentes [Fig. 205] ..... h

h(g). Escutelo con perfil fuertemente convexo, borde posterior (al menos detrás de espinas o tubérculos cuando éstos están presentes) en ángulo casi recto con la parte superior [Fig. 214]; escutelo a veces bilobado, bituberculado, o biespinoso [Fig. 216]; metanoto en declive, como el perfil del propodeo [Fig. 214] ..... ir a 109

— Escutelo menos fuertemente convexo, tercio posterior y parte superior en ángulo de 110° o más [Fig. 215]; escutelo no bituberculado; metanoto frecuentemente casi horizontal, al igual que la base del propodeo i

i(h). Closed cells of forewing largely hairless [Fig. 228]; wing surface beyond veins coarsely papillate and hairless [Fig. 228] ..... go to couplet 118

— Entire forewing with numerous minute hairs [Fig. 229]; wing surface beyond veins not papillate or papillae ending in or mixed with hairs [Fig. 229] .. .. j

j(i). Shiny, often metallic; clypeus of female usually with short, longitudinal, median white or yellow bar; hairs short and sparse, not forming metasomal bands; body slender; pygidial plate absent [Fig. 234] ..... *Ceratina* (part) [149]

— Not shiny or metallic; clypeus of female without longitudinal median pale bar; hairs commonly dense, often obscuring surface in some areas, often forming metasomal hair bands; body usually robust; pygidial plate usually present [Fig. 235] .... go to couplet 125

k(a). Marginal cell shorter than stigma and behind apical prolongation of stigma (scopa absent) .... *Neolarra* [142]

— Marginal cell longer than stigma and largely on costal wing margin, not behind stigma.....l

l(k). Second submarginal cell little, if any, more than half as long as first, rarely three-fifths as long [Fig. 310]; first recurrent vein received by first submarginal cell or meeting first transverse cubital vein [Fig. 310], rarely beyond it (scopa absent) .... go to couplet 178

— Second submarginal cell at least two-thirds as long as first and receiving first recurrent vein [Fig. 311] ..... m

m(l). Marginal cell with apex pointed on or very near wing margin [Fig. 315]; jugal lobe of hind wing one-sixth as long as vannal lobe or less [Fig. 355] ..... go to couplet 191

— Marginal cell with apex rounded, truncate, or, if pointed, bent away from costa, so that apex is three or more vein widths from wing margin [Figs. 352 and 353]; jugal lobe of hind wing more than one-sixth as long as vannal lobe [Figs. 349 and 350].. n

i(h). Celdas cerradas del ala anterior mayormente glabras [Fig. 228]; superficie alar después de las venas glabra y con gruesas papilas [Fig. 228] ..... ir a 118

— Toda el ala anterior con numerosos pelitos finos [Fig. 229]; superficie alar después de las venas no papilada o las papilas terminadas en o mezcladas con pelos [Fig. 229].. j

j(i). Cuerpo brillante, frecuentemente metálico; clípeo de la hembra usualmente con una barra corta longitudinal media blanca o amarilla; pelos cortos y ralos, sin formar bandas metasomales; cuerpo delgado; placa pigidial ausente [Fig. 234] ..... *Ceratina* (parte) [149]

— Cuerpo no brillante ni metálico; clípeo de la hembra sin barra longitudinal media clara; pelos comúnmente densos, ocultando frecuentemente la superficie en algunas áreas, formando frecuentemente bandas metasomales; cuerpo usualmente robusto; placa pigidial usualmente presente [Fig. 235] ..... ir a 125

k(a). Celda marginal más corta que el estigma y ubicada detrás de la prolongación apical de éste (escopa ausente)..... ..... *Neolarra* [142]

— Celda marginal más larga que el estigma y ubicada mayormente sobre el margen costal del ala, no detrás del estigma l

l(k). Segunda celda submarginal poco o nada más larga que la mitad de la primera o raramente tres quintos de ésta [Fig. 310]; primera vena recurrente se une a la primera celda submarginal o a la vena primera transversa cubital [Fig. 310], raramente después de ésta (escopa ausente) .... ir a 178

— Segunda celda submarginal al menos dos tercios tan larga como la primera y recibiendo la primera vena recurrente [Fig. 311] ..... m

m(l). Celda marginal con ápice aguzado sobre el margen del ala o muy próximo a éste [Fig. 315]; lóbulo yugal del ala posterior un sexto del largo del lóbulo vanal, o menos [Fig. 355] ..... ir a 191

— Celda marginal con ápice redondeado, trunco, o si en punta, separado del margen costal por tres o más veces el grosor de la vena [Figs. 352 y 353]; lóbulo yugal del ala posterior más de un sexto del lóbulo vanal [Figs. 349 y 350] ..... n

n(m). Marginal cell not or scarcely extending beyond second submarginal cell [Fig. 351] .... *Brachymelecta* [123]

— Marginal cell extending well beyond second submarginal cell [Fig. 352] ..... o

o(n). Apex of marginal cell bent sharply away from wing margin so that the cell is obliquely truncate [Fig. 352] ..... go to couplet 199

— Apex of marginal cell bent gradually away from wing margin [Fig. 353] ..... go to couplet 201

Apidae

a. Hind tibial spurs present [Fig. 55] .... go to couplet 19

— Hind tibial spurs absent [Fig. 54] .....b

b(a). Eyes hairy; venation strong [as in Fig. 35] .... *Apis* [151]

— Eyes bare; transverse cubital and second recurrent veins weak compared with other veins or absent; marginal cell with apex open or closed by weak veins [Figs. 32–34] ..... go to couplet 2

n(m). Celda marginal excediendo poco o nada la segunda celda submarginal [Fig. 351] ..... *Brachymelecta* [123]

— Celda marginal extendiéndose mucho más allá de la segunda celda submarginal [Fig. 352] ..... o

o(n). Celda marginal con ápice bruscamente alejado del margen alar, de modo que es oblicuamente trunca [Fig. 352] .... ir a 199

— Celda marginal con ápice gradualmente alejado del margen alar [Fig. 353] ..... ir a 201

Apidae

a. Espolones tibiales posteriores presentes [Fig. 55]...ir a 19

— Espolones tibiales posteriores ausentes [Fig. 54] ..... b

b(a). Ojos pilosos; venación fuerte [como en Fig. 35] .... *Apis* [151]

— Ojos sin pelos; venas transversas cubitales y segunda recurrente débiles comparadas con otras venas, o ausentes; celda marginal abierta apicalmente o cerrada por venas débiles [Figs. 32–34] .....ir a 2

Notes on the Genera

The notes below are intended to supplement "Key to the Genera," in that they should help to indicate to the user whether he or she has been successful. The notes are organized according to family, subfamily, and tribe, so that related genera are near one another, even if they appear far apart in "Key to the Genera." The brief family characterizations, as well as "Key to the Families," are probably accurate for our area but not necessarily worldwide.

DESCRIPTIVE TERMS. For each genus, there are comments on appearance and sometimes on distinguishing features other than those in "Key to the Genera." General body shape is described in terms (listed below) such that with a single word a person who knows a few common bee genera can get an idea of what an unknown genus looks like. Body forms are best appreciated in dorsal view.

andreniform—body form of *Andrena* [Figs. 421–424], *Halictus* [Figs. 439 and 440], or *Colletes* [Fig. 417]. Male often more slender, with more parallel-sided metasoma, than female.

anthophoriform—body form of *Anthophora* [Figs. 473 and 474]. Robust, with head and thorax hairy, enhancing the aspect of robustness; metasoma beyond first segment usually with little erect hair.

apiform—body form of workers of *Apis mellifera* [Fig. 507]. That is, more robust than andreniform and more slender than euceriform.

bombiform—body form of *Bombus* [Figs. 508 and 509]. Like anthophoriform but metasoma with much erect hair, like thorax.

epeoliform—body form of *Epeolus* or *Triepeolus* [Fig. 493]. Somewhat more robust than *Nomada* but nonetheless wasplike parasitic bees; scopa absent; body often with areas of short, pale pubescence forming a conspicuous pattern.

euceriform—body form of *Melissodes* [Figs. 481 and 482]. Similar to anthophoriform but somewhat less robust.

heriadiform—body form of *Hoplitis* [Fig. 471], *Heriades*

[Figs. 469 and 470], or *Megachile* (*Chelostomoides*) [Fig. 465]. Similar to megachiliform but more slender, metasoma parallel-sided.

hylaeiform—body form of *Hylaeus* [Fig. 420]. Slender, hairs inconspicuous without magnification, scopa inconspicuous or absent.

megachiliform—body form of *Megachile* (*Megachile*) [Figs. 463 and 464], *Osmia* [Fig. 472], or *Dianthidium* [Fig. 457]. Heavy body, thick head, metasoma rather wide, not parallel-sided.

nomadiform—body form of *Nomada* [Figs. 498 and 499]. Slender, wasplike, not noticeably hairy, often with yellow or red markings; scopa absent.

trigoniform—body form of *Trigona* [Fig. 519] and its relatives—of the genus *Partamona,* for example [Fig. 518]. Metasoma small or slender; body not conspicuously hairy, that is, hairs short and metasoma usually shiny.

Many bees do not fall unequivocally into one or another of the above categories. Much of a specimen's appearance depends on how full the crop was when the specimen was killed, how much the metasoma has telescoped in drying, and so forth. Nonetheless, we think these terms may be useful to give an idea of the characteristic aspect of a genus.

CONTENT OF THE NOTES. The notes and "Key to the Genera" give characteristics of species within our area, which is America north of the Colombia-Panama border, including the Antilles. Extralimital species may not agree with all characters listed. Under each family, taxa are arranged alphabetically. The classification under each family is merely an abbreviated table of contents.

In most bees the integument is black. If it is extensively otherwise (e.g., red or metallic green), that is noted. Hairiness, when mentioned, refers to long hairs, giving a more robust and fuzzy aspect, unless otherwise indicated.

For each genus, after listing some characteristics, the notes give a subjective idea of abundance, based on collecting experience; that is followed by the number of species within our area. Frequently that number is the number of names, sometimes reduced by those that are known to be synonyms. The numbers, of course, are more accurate for revised groups. Sometimes the number given is the number of species names listed by Hurd (1979) plus an estimate for additional Mesoamerican and Antillean species, because Hurd's catalog does not include Mexico, Central America, or the Antilles. Trinidad is not included for estimates of number of species.

Next, the notes indicate the range of the genus within our area, including a rough indication of more extensive neotropical range, followed by a parenthetical notation if the range is more extensive—for example, holarctic or cosmopolitan. The word *Mesoamerica* as used here means Mexico and Central America, including Panama. The word *tropical* is frequently used and refers to lowland areas, usually moist or mesic. We make no other effort to provide biogeographically relevant materials. Persons desiring such information should consult Michener (1979).

Most bees are solitary, that is, with one female per nest, and the nests are burrows in the ground made by the bees. Sometimes nests occur in large and dense aggregations but the bees are nonetheless considered solitary. Notation is made of genera that are eusocial (i.e., with queen and worker castes living together) or that nest in different sites or substrates or probably do so. Nests are unknown for certain genera; a review of known immature stages was made by McGinley (1989).

Parasitic bees, or cuckoo bees, have no pollen-carrying scopa, a feature present in females of nearly all nonparasitic bees. Cleptoparasites enter nests of hosts, lay eggs in the host cells, and leave. Social parasites remain in nests of colonial hosts and become, in effect, members of the colony. The only socially parasitic bees in our area are *Psithyrus,* parasites of *Bombus*.

Next, the subgenera found within our area are listed. For genera whose subgenera are often given generic status, such as *Lasioglossum,* we give keys to subgenera, or when there are only two such subgenera in our area, we give distinguishing characters.

Under "Revision(s)" are cited reviews, keys, and so forth, as well as full revisions; sometimes we give a reference to a relevant work even if it lacks keys to species. To avoid repetition, the major faunal work (Mitchell 1960, 1962), which includes keys to species as well as descriptions of the species found east of the Mississippi River (i.e., eastern U.S.A. and Canada), is not cited under each genus; however, that work contains a "revision" of each

genus for that area. Likewise, the catalog of species of America north of Mexico (Hurd 1979) is not cited in the comments on the genera.

Finally, in parentheses, we show the couplet or couplets to which the genus runs in "Key to the Genera."

Synonymous names exist for many genera. We list those names that have been in recent use and that might cause confusion. For further details, see the section "Classificatory and Nomenclatural Changes."

Family Colletidae

Glossa short, broadly truncate to bifid. Labial palpus with segments similar, none of them elongate and sheathlike.

CLASSIFICATION

Subfamily Colletinae (*Colletes, Eulonchopria*)
Subfamily Diphaglossinae
  Tribe Caupolicanini (*Caupolicana* to *Ptiloglossa*)
  Tribe Dissoglottini (*Mydrosoma*)
Subfamily Hylaeinae (*Hylaeus*)
Subfamily Xeromelissinae (*Chilicola*)

GENERIC STUDIES. For Colletinae, Michener (1989); for Diphaglossinae, Michener (1966). This family is most abundant and diversified in Australia and temperate South America.

Colletinae

1. ***Colletes*** Latreille: Rather small to moderate-sized or a few rather large; moderately hairy, andreniform [Fig. 417] to apiform, usually with pale tergal hair bands, superficially similar to *Halictus* and *Andrena* but with head in facial view more tapering below, inner orbits of eyes converging strongly below; glossa short and shallowly bilobed. Common; about 100 species north of Mexico and many more in Mesoamerica. Southern Canada, entire U.S.A., Mesoamerica, Antilles; boreal to deserts to moist tropics (cosmopolitan except Australia). Revision: Stephen (1954), U.S.A. and Canadian species. (couplet 25)

This is the only genus of bees with the second recurrent vein arcuate distad in its posterior half [Fig. 79]. Various subgeneric names are available, but the subgenera are unresolved. Rather distinctive groups in our area have been called *Ptilopoda* Friese (see Michener 1954a) and *Monidia* Cockerell (see Michener 1989).

2. ***Eulonchopria*** Brèthes: Small to moderate-sized;

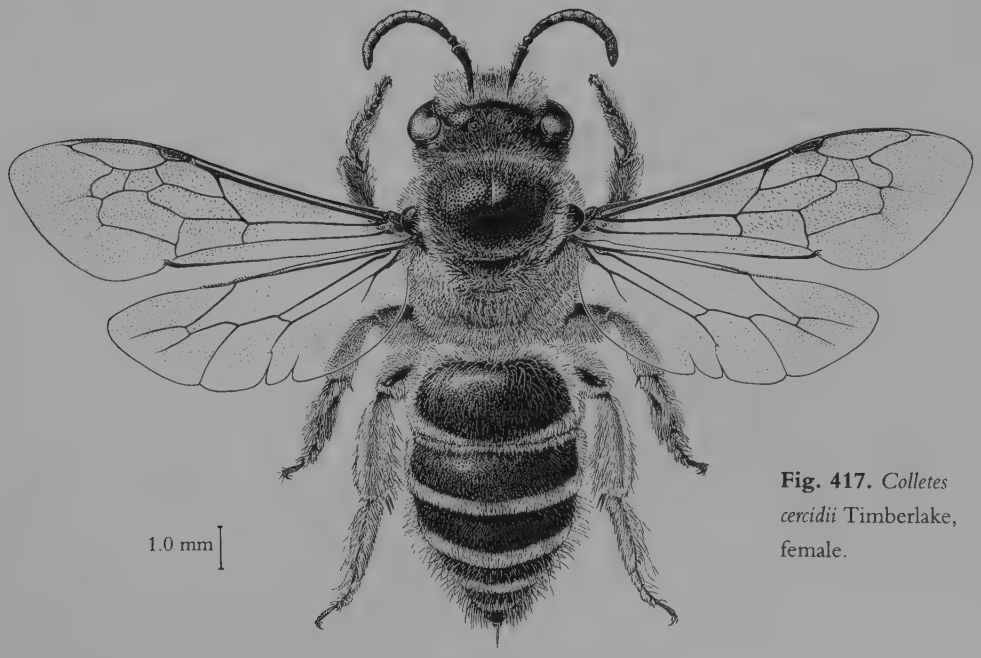


Fig. 417. *Colletes cercidii* Timberlake, female.

coarsely sculptured, sparsely hairy, robust andreniform or apiform, with yellow integumental tergal bands; forewings often folded longitudinally like those of vespids. Uncommon; two species. Xeric neotropical regions, South America, Nicaragua to western Mexico (Oaxaca to Nayarit), north to southern Arizona. Revisions: Michener (1963, 1985b). (couplet 123)

Diphaglossinae: Caupolicanini

3. ***Caupolicana*** Spinola: Large or very large; apiform [Fig. 418], with bifid glossa, hairy, sometimes with strong white hair bands on terga. Uncommon in southwestern U.S.A., otherwise rare; six North American species, three others in Antilles. Drier parts of neotropical region; in our area Greater Antilles, Puebla north to Arizona, Kansas, and North Carolina; absent in moist tropics except for Costa Rica (T. L. Griswold, pers. comm. 1992). Flight principally in early morning. Subgenera: *Alayoapis* Michener (Antilles), *Caupolicana* Spinola s.str., *Zikanapis* Moure (rare). Revision: Michener (1966). (couplet 17)

4. ***Crawfordapis*** Moure: Similar to *Ptiloglossa* but not metallic. Rare; one species, *C. luctuosa* (Smith). Panama to Mexico at high altitudes. See Michener (1966). (couplet 17)

Fig. 418. *Caupolicana yarrowi* (Cresson), female (20 mm).

Fig. 419. *Ptiloglossa arizonensis* Timberlake, female (18 mm).

5. ***Ptiloglossa*** Smith: Large, robust, hairy, apiform [Fig. 419], with bifid glossa; metasoma with weak bluish or greenish metallic tints. Uncommon; at least 10 Mesoamerican species, 2 or 3 in U.S.A. Widespread in American tropics north through Mexico to southern Arizona. Flight mostly at dawn. Revision: None; see Michener (1966). (couplet 16)

Diphaglossinae: Dissoglottini (synonym: Mydrosomini)

6. ***Mydrosoma*** Smith: Moderate size, moderately hairy, andreniform, glossa bifid; metasoma usually with faint bluish or greenish tint. Rare; six species. Widespread in American tropics, north in Mexico to Sinaloa. Revision: Michener (1986c). (couplets 15 and 124)

Some species have been placed in the synonymous genus *Bicornelia* Friese. At least one species flies principally in late afternoon. Because of variation among species in wing venation, this genus appears twice in "Key to the Genera"; see couplet 14.

Hylaeinae

7. ***Hylaeus*** Fabricius: Minute to small; slender, nonhairy, hylaeiform [Fig. 420]; black or rarely partly red, usually with limited yellow or white areas on face, thorax, and legs, rarely on metasoma; aspect that of small black wasp; glossa broadly truncate; scopa of female entirely absent (pollen transported in crop). Common in temperate areas, uncommon to rare in tropics; about 50 species north of Mexico and additional species in Mesoamerica. Boreal Canada to Panama and Antilles (cosmopolitan). Nests in hollow twigs or stems, occasionally in preformed burrows in banks. Subgenera: *Cephalylaeus* Michener, *Gongyloprosopis* Snelling, *Hylaeana* Michener, *Hylaeopsis* Michener, *Hylaeus* Fabricius s.str., *Metziella* Michener, *Paraprosopis* Popov, *Prosopella* Snelling, *Prosopis* Fabricius, *Spatulariella* Popov (introduced in California). Revisions: Metz (1911), Snelling (1966b, 1968, 1970); none of these papers covers Mesoamerican species adequately. (couplet 177)

The genus was formerly called *Prosopis* and one or two European authors still use that name.

Xeromelissinae (synonym: Chilicolinae)

8. ***Chilicola*** Spinola: Minute to small; slender, nonhairy, hylaeiform; black, without yellow marks except on clypeus of some males; glossa broadly truncate; scopa limited, sparse on hind femora and perhaps tibiae, better developed on S1–S3. Uncommon in our area; five species, only three named. Neotropical, in xeric or montane regions, north to states of Hidalgo and Jalisco, also Lesser Antilles. Nests in stems and holes in wood. Subgenera: *Anoediscelis* Toro and Moldenke and *Hylaeosoma* Ashmead; *Chilicola* s.str. is South American. Revisions: Michener (1994); Toro and Michener (1975). (couplet 177)

Fig. 420. *Hylaeus modestus modestus* Say, female (6 mm).

Family Andrenidae

Glossa short to long, pointed, with or without flabellum. Labial palpus with segments similar, none of them elongate and sheathlike or only first segment elongate (*Andrena micheneriana* LaBerge has the first two segments elongate). Mentum membranous or sclerotized; lorum scoop-shaped, or Y-shaped with arms not as slender as in long-tongued bees; mentum and lorum forming a lobe that projects behind proboscis when proboscis is folded. Two subantennal sutures (one in some species of *Heterosarus* and *Pseudopanurgus*). Facial fovea present in females and many males.

CLASSIFICATION

Subfamily Andreninae (*Ancylandrena* to *Megandrena*)
Subfamily Panurginae (*Anthemurgus* to *Xenopanurgus*)

GENERIC STUDIES. Genera of Andreninae were reviewed by Michener (1986b), of Panurginae by Ruz (1987).

Andreninae

9. ***Ancylandrena*** Cockerell: Similar to large, hairy, robust, nonmetallic *Andrena;* floccus of female hind trochanter entirely absent. Rare; four species. Xeric parts of southern California to New Mexico, Baja California, and Sonora. Revision: Zavortink (1974). (couplets 44♀ and 47♂)

10. ***Andrena*** Fabricius: Black or dull metallic blue or green, moderately hairy, andreniform [Figs. 421–424], sometimes with metasoma red, terga frequently with hair bands; face sometimes with yellow marks, especially clypeus of males. Common; about 550 species. Boreal regions south to Mexican plateau and beyond; rare in tropics south to Panama (holarctic and African). Subgenera: *Anchandrena* LaBerge; *Andrena* Fabricius s.str.; *Aporandrena* Lanham; *Archiandrena* LaBerge; *Augandrena* LaBerge; *Belandrena* Ribble; *Callandrena* Cockerell; *Celetandrena* LaBerge and Hurd; *Charitandrena* Hedicke; *Cnemidandrena* Hedicke; *Conandrena* Viereck; *Cremnandrena* LaBerge; *Dactylandrena* Viereck; *Dasyandrena* LaBerge; *Derandrena* Ribble; *Diandrena* Cockerell; *Erandrena* LaBerge; *Eremandrena* LaBerge; *Euandrena* Hedicke; *Geissandrena* LaBerge and Ribble; *Genyandrena* LaBerge; *Gonandrena* Viereck; *Hesperandrena* Timberlake; *Holandrena* Pérez; *Iomelissa* Robertson; *Larandrena* LaBerge; *Leucandrena* Hedicke; *Melandrena* Pérez; *Micrandrena* Ashmead; *Nemandrena* LaBerge; *Notandrena* Pérez; *Oligandrena* Lanham; *Onagrandrena* Linsley and MacSwain; *Oxyandrena* LaBerge; *Parandrena* Robertson; *Pelicandrena* LaBerge and Ribble; *Plastandrena* Hedicke; *Psammandrena* LaBerge; *Ptilandrena* Robertson; *Rhacandrena* LaBerge; *Rhaphandrena* LaBerge; *Scaphandrena* Lanham; *Scoliandrena* Lanham; *Scrapteropsis* Viereck; *Simandrena* Pérez; *Taeniandrena* Hedicke; *Thysandrena* Lanham; *Trachandrena* Robertson; *Tylandrena* LaBerge; *Xiphandrena* LaBerge. Keys to the subgenera: La-

421

Figs. 421 and 422. *Andrena wilkella* (Kirby), male (9 mm) and female (11 mm).

422

423

Figs. 423 and 424. *Andrena surda* Cockerell, male (10 mm) and female (11 mm).

424

Berge (1964, 1986). Revisions by subgenus (see titles of papers in Bibliography): Bouseman and LaBerge (1979); Donovan (1977); LaBerge (1967, 1969, 1971a,b, 1973, 1977, 1980, 1986, 1987, 1989b); LaBerge and Bouseman (1970); LaBerge and Ribble (1972, 1975); Linsley and MacSwain (1955); Linsley et al. (1973); Ribble (1967, 1968a,b, 1974); Thorp (1969). (couplets 45♀, 47♂, and 193)

The great majority of species have three submarginal cells (couplets 45 and 47) but two subgenera (*Parandrena* and *Diandrena*) and scattered species in other subgenera have only two submarginal cells (couplet 193).

11. ***Megandrena*** Cockerell: Similar to large nonmetallic *Andrena* with apical metasomal hair bands; metasoma sometimes red. Rare; two species. Deserts of Nevada, Arizona, southern California, and probably northwestern Mexico. Subgenera: *Erythrandrena* Zavortink, *Megandrena* Cockerell s.str. See Zavortink (1972); Michener (1986b). (couplets 45♀ and 46♂)

Panurginae

12. ***Anthemurgus*** Robertson: Small, robust andreniform (males more slender). Rare; one species, *A. passiflorae* Robertson. Kansas to North Carolina. Monolectic on flowers of *Passiflora lutea*. (couplet 232)

13. ***Calliopsis*** Smith: Minute to smallish or even moderate-sized andreniform bees [Figs. 425 and 426], usually with either yellow integumental tergal bands or hair bands; metasoma occasionally red; face usually with yellow or white markings; male genitalia with greatly enlarged penis valves and with gonostyli absent or essentially so (no other bees in our area have genitalia of this style). Moderately common, especially in western U.S.A.; about 75 species. Southern Canada, throughout U.S.A. and Mexico to Central and South America. Subgenera: (1) *Macronomadopsis* Rozen, *Micronomadopsis* Rozen, *Nomadopsis* Ashmead; (2) *Calliopsima* Shinn, *Calliopsis* Smith s.str., *Perissander* Michener, *Verbenapis* Cockerell and Atkins; (3) *Hypomacrotera* Cockerell and Porter. Revisions: Rozen (1958), subgenera of group 1; Shinn (1967), subgenera of group 2. (couplet 228)

The three numbered groups of subgenera listed above have long been regarded as three genera. A detailed study

by Ruz (1987, 1991) emphasizes the homogeneity of the genus and does not show other characters dividing the group in the traditional way. There may be closer relationships between certain subgenera in different groups than among the subgenera within groups. In some ways, Ruz regards the subgenus *Verbenapis* as the most distinctive of all the subgenera, so that one might recognize a genus *Verbenapis* and use *Calliopsis* for all the rest. Such a classification is not recommended, however. The following key separates the three traditional genera:

a. Metasomal terga with yellow integumental bands (western North America) ..... *Nomadopsis*

— Metasomal terga without yellow bands ..... b

b(a). Metasomal terga with apical pale hair bands .... *Calliopsis* s.str.

— Metasomal terga without apical hair bands (SW) .... *Hypomacrotera*

14. ***Heterosarus*** Robertson: Minute to smallish; slender andreniform or almost hylaeiform. Common in Rocky Mountain and Plains area, uncommon elsewhere or rare in the tropics; about 50 species. U.S.A. and southern Canada, ranging south through Mexico to Panama; few species in tropics. Subgenera: *Heterosarus* Robertson s.str. and *Pterosarus* Timberlake, sometimes regarded as distinct genera (Timberlake 1975) and sometimes both included in *Pseudopanurgus*. Revisions: Timberlake (1975), subgenus *Heterosarus* s.str.; Timberlake (1967), subgenus *Pterosarus*. (couplet 233)

The subgenera have been regarded as separate genera but their close relationship is best shown by placing them in a single genus. They can be distinguished as follows:

a. Scopal hairs of female hind tibia with distinct branches; S6 of male with narrow, deep, median apical emargination ..... *Pterosarus*

— Scopal hairs simple or nearly so; S6 of male with V-shaped apical emargination..... *Heterosarus* s.str.

15. ***Metapsaenythia*** Timberlake: Smallish, slender andreniform [Fig. 427], with red or partly red metasoma. Uncommon; two species. Central and eastern U.S.A., probably northeastern Mexico, also Sonora. Revision: Timberlake (1969b). (couplet 232)

16. ***Panurginus*** Nylander: Small, slender, black, andreniform, the male almost hylaeiform and often with yellow clypeus. Uncommon in western North America, rare in east; 19 species. Southern Canada, U.S.A., and northern Mexico (holarctic). Revisions: Crawford (1926); Michener (1935), one group of species. (couplet 229)

17. ***Perdita*** Smith: Minute (2 mm long) to small, rarely moderate-sized; andreniform [Figs. 428 and 429]; black to metallic blue or green, commonly with yellow or white markings; metasoma or whole body sometimes yellow, red, or white. The short, truncate marginal cell characteristic of most species (see couplet 173 and Fig. 306) is almost unique among nonparasitic bees, but in some of the

Fig. 425. *Calliopsis* (*Micronomadopsis*) *scutellaris* Fowler, male (5.5 mm).

Fig. 426. *Calliopsis edwardsii* Cresson, female (9 mm).

Fig. 427. *Metapsaenythia abdominalis tricolor* (Cockerell), female (8 mm).

Fig. 428. *Perdita portalis* Timberlake, male (4 mm).

Fig. 429. *Perdita stathamae* Timberlake, male.

larger species, especially in the subgenus *Macrotera,* the marginal cell resembles that of some *Heterosarus*. Common in plains and deserts, uncommon in humid regions or common in some sandy places; about 850 species. Southern Canada to Guatemala; some species in tropics as well as highlands of Mexico; one species reported from Do-

minican Republic (G. C. Eickwort, pers. comm. 1991). All species more or less oligolectic; many are communal, several females going in and out of the same burrow. Subgenera: *Allomacrotera* Timberlake, *Alloperdita* Viereck, *Callomacrotera* Timberlake, *Cockerellia* Ashmead, *Cockerellula* Strand, *Epimacrotera* Timberlake, *Glossoperdita* Cockerell, *Hesperoperdita* Timberlake, *Heteroperdita* Timberlake, *Hexaperdita* Timberlake, *Macrotera* Smith, *Macroterella* Timberlake, *Macroteropsis* Ashmead, *Pentaperdita* Cockerell and Porter, *Perdita* Smith s.str., *Perditella* Cockerell, *Procockerellia* Timberlake, *Pseudomacrotera* Timberlake, *Pygoperdita* Timberlake, *Xeromacrotera* Timberlake, *Xerophasma* Cockerell. Revisions: Timberlake (1954, 1956, 1958, 1960, 1962, 1964, 1968, 1971, 1980b). (couplets 91 and 174)

The vast majority of species have two submarginal cells and therefore run to 174 in the key; however, some species of subgenus *Alloperdita* and all species of the subgenus *Xerophasma* have three submarginal cells and run to couplet 91. There is great diversity among species of *Perdita,* and probably it will be divided into several genera in the future.

18. ***Protandrena*** Cockerell: Small to moderate-sized, andreniform, metasoma sometimes red. Except for a few *Perdita,* this is the only panurgine genus in our area with three submarginal cells. Uncommon; 51 species. North Dakota to Texas west to California, south through Mexico to Oaxaca, absent in tropics except Costa Rica record (T. L. Griswold, pers. comm. 1992). Revisions: Timberlake (1955b, as *Psaenythia;* 1976). (couplet 124)

This genus was formerly included in the South American genus *Psaenythia.*

19. ***Pseudopanurgus*** Cockerell: Small to moderate-sized, robust andreniform or apiform (males more slender), rather coarsely sculptured. Uncommon, most common in central and southwestern U.S.A.; about 30 species. Southern half of U.S.A., north as far as Wyoming, south through Mexico to Costa Rica. Revision: Timberlake (1973). (couplet 233)

20. ***Xenopanurgus*** Michener: Smallish, dark metallic blue, slender andreniform. Rare; one species, *X. readioi* Michener. Mountains of state of Mexico to those of southern Arizona. Revisions: Shinn (1964). A second described species (Ruz 1990) is better placed in *Heterosarus* (D. Yanega, pers. comm.). (couplet 230)

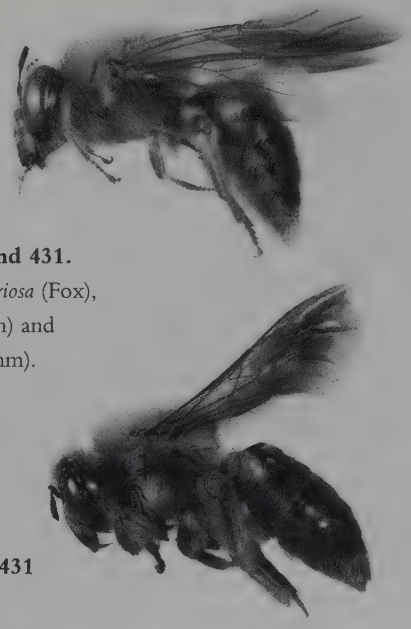
Family Oxaeidae

Glossa short, pointed, without flabellum. Labial palpus with segments similar, none of them elongate and sheathlike. Mentum short and membranous or indistinguishably fused to lorum, depending on interpretation (see Michener 1985a); mentum and lorum not forming lobe projecting behind proboscis. Two subantennal sutures. Facial fovea absent.

GENERIC STUDIES. A generic study is by Hurd and Linsley (1976). This family is restricted to the Western Hemisphere. No subfamilies or tribes are recognized.

21. ***Oxaea*** Klug: Large, hairy, apiform, with metasomal terga or bands on them bright green. The only other large bees with green bands are some species of *Nomia;* the bands in *Nomia* are not metallic but more pearly, and *Nomia* has a distinct stigma. Rare; one species. Lowland tropics of South America to Veracruz (the Mexican record is doubtful, but specimens exist from Guatemala and there is a specimen of the *Oxaea*-parasite *Thalestria* from Costa Rica). Revision: None. (couplet 94)

22. ***Protoxaea*** Cockerell and Porter: Large, hairy, apiform [Figs. 430 and 431] with wing venation and lack of



Figs. 430 and 431. *Protoxaea gloriosa* (Fox), male (20 mm) and female (22 mm).

stigma as in *Oxaea;* terga black, sometimes feebly metallic, without colored bands. Uncommon or sometimes common; 10 species. Louisiana to Arizona, south to Chiapas, mostly in xeric areas, including xeric tropics. Subgenera: *Mesoxaea* Hurd and Linsley, *Protoxaea* Cockerell and Porter s.str. Revision: Hurd and Linsley (1976). (couplet 94)

The subgenus *Mesoxaea* Hurd and Linsley has been given generic status, but the differences between *Protoxaea* and *Mesoxaea* suggest the differences between subgenera among most other bees. The distinction is as follows:

a. S8 of male entire; T5 (female) and T6 (male) without conspicuous tufts of white hair... *Protoxaea* s.str.

— S8 of male deeply emarginate apically; T5 (female) and T6 (male) with conspicuous lateral tufts of long white hair ..... *Mesoxaea*

Family Halictidae

Glossa short to rather long, pointed, without flabellum. Labial palpus with segments similar, none of them elongate and sheathlike or first sometimes elongate. Mentum membranous; lorum weakly sclerotized or sclerotized only laterally; mentum and lorum not forming lobe projecting behind proboscis (Michener 1985a). Lacinia a small lobe on base of proboscis, well separated from rest of maxilla (Michener and Greenberg 1985). One subantennal suture. Facial fovea absent.

See Moure and Hurd (1987) for a catalog of species of the Western Hemisphere.

CLASSIFICATION

Subfamily Halictinae
  Tribe Augochlorini (*Augochlora* to *Temnosoma*)
  Tribe Halictini (*Agapostemon* to *Sphecodes*)
Subfamily Nomiinae (*Dieunomia, Nomia*)
Subfamily Rophitinae (*Conanthalictus* to *Xeralictus*)

GENERIC STUDIES. For Rophitinae (= Dufoureinae), Michener (1965b); for Augochlorini, Eickwort (1969); for relatives of *Agapostemon,* Roberts and Brooks (1987); for parasitic genera, Michener (1978).

Halictinae: Augochlorini

23. ***Augochlora*** Smith: Small to moderate-sized; andreniform; bright green or blue, in some tropical species with brassy or red, or almost entirely purple or black. Common; many neotropical species, about 40 in Mesoamerica, 4 species in U.S.A. (3 of them reach only southernmost Texas). Tropical America north through the Antilles and tropical Mexico to eastern and central U.S.A. and southern Canada; absent in desertic areas and western U.S.A. Subgenera: *Augochlora* Smith s.str. (solitary, nests in rotting wood), *Oxystoglossella* Eickwort (eusocial, nests in ground), and *Mycterochlora* Eickwort. Revision: None. (couplets 80♀ and 89♂)

24. ***Augochlorella*** Sandhouse: Small; andreniform; bright metallic green, bluish, or brassy; often smaller than *Augochlora* but larger than *Pereirapis*. Common except uncommon in deserts; seven species in U.S.A., a few others in Mesoamerica. Widespread in neotropics; uncommon in Central America, north through Mexico, U.S.A., and southern Canada. Eusocial in small colonies. Revision: Ordway (1966), U.S. species. (couplets 81♀ and 90♂)

Augochlorella should possibly be regarded as a subgenus of *Augochlora*.

25. ***Augochloropsis*** Cockerell: Small to moderate-sized or even large; apiform; bright green or some tropical species with red metasoma or body black; more robust than *Augochlorella* and *Augochlora* [Fig. 432]. Common; many species in tropics, 3 in U.S.A., 18 in Mesoamerica. Tropical America north throughout eastern and central U.S.A. to southern Canada, west to Arizona. Subgenera: *Augochloropsis* Cockerell s.str. (tropics north into Mexico) and *Paraugochloropsis* Schrottky. Revision: None; for U.S. species, see Mitchell (1960). (couplet 76)

26. ***Caenaugochlora*** Michener: Moderate-sized or small; andreniform; bright metallic green or brassy. Long hairs on eyes of most species suggest hairy-eyed Halictini such as *Caenohalictus,* from which it differs in tribal characters (couplet 54). Uncommon; 13 species. Tropical America, north into Mexico as far as San Luis Potosí and Sinaloa. Subgenera: *Caenaugochlora* Michener s.str., *Ctenaugochlora* Eickwort. Revision: None. (couplets 84♀ and 86♂)

Caenaugochlora could be considered a subgenus of *Pseudaugochloropsis*.

27. ***Chlerogella*** Michener: Small, andreniform, green with testaceous areas; marginal cell pointed at apex. Very rare; one species, *C. elongaticeps* Michener. Andean region, Panama, Costa Rica. (couplets 83♀ and 88♂)

28. ***Megalopta*** Smith: Moderate-sized to rather large; andreniform [Fig. 433]; usually more or less testaceous with bright metallic green reflections. Perhaps not uncommon but nocturnal and rarely collected; four species. Tropical America, north through Mexican tropics at least to Nayarit. Nests in rotting wood and vines. Revision: None. (couplet 75)

Our species belong to the subgenus *Megalopta* s.str.

29. ***Megommation*** Moure: See Appendix C.

30. ***Neocorynura*** Schrottky: Moderate-sized, bright green to largely black, often with wings darkened; females andreniform [Fig. 435], males with metasoma attenuate basally (petiolate) [Fig. 434] as in *Habralictus,* which consists of much smaller species. Sometimes common; 12 species. Widespread in tropical America north to Lesser Antilles and through tropical Mexico to San Luis Potosí. Certain species (in South America) nest in wood, but others nest in soil. Revision: None. (couplets 82♀ and 87♂)

Our species belong to the subgenus *Neocorynura* s.str.

31. ***Pereirapis*** Moure: Minute, andreniform, bright metallic green, commonly with blackish metasoma. Common; three species. Tropical America northward through tropical Mexico to Jalisco; a doubtful record from Haiti. Revision: None. (couplets 81♀ and 90♂)

Like *Augochlorella, Pereirapis* might be regarded as a subgenus of *Augochlora.*

32. ***Pseudaugochloropsis*** Schrottky: Rather large, andreniform, bright metallic green with posterior margins of terga black or body entirely black. Not uncommon; two species. Widespread in tropical America, north to Lesser Antilles and through tropical Mexico to Sinaloa and southernmost Texas. Revision: None. (couplets 84♀ and 86♂)

The name *Pseudaugochlora* Michener has also been applied to this group.

33. ***Temnosoma*** Smith: Small to moderate-sized, andreniform, brilliant green, coarsely punctate [Fig. 436]; bases of metasomal terga depressed (constricted as seen in profile). Rare; few species (perhaps only two in our area). Widespread in American tropics, north to San Luis Potosí and southern Arizona, also Antilles. Cleptoparasitic, prob-

Fig. 432. *Augochloropsis sumptuosa* (Smith), female (10 mm).

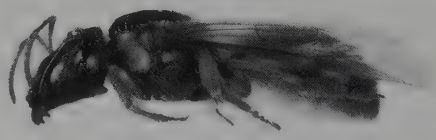
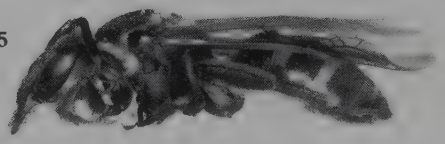


Fig. 433. *Megalopta* sp., female (14 mm).

434

Figs. 434 and 435. *Neocorynura* sp., male (9 mm) and female (8 mm).



435

Fig. 436. *Temnosoma* sp., female (8 mm).

ably on other Augochlorini. Revision: None. (couplets 50♀ and 77♂)

Our species belong to the subgenus *Temnosoma* s.str.

Halictinae: Halictini

34. ***Agapostemon*** Guérin-Méneville: Moderate-sized to large, andreniform [Figs. 437 and 438]; eyes bare or nearly so; head and thorax bright green, rarely blue or blackish; metasoma of female green, testaceous, or black, of male almost always with strong, transverse, yellow integumental bands. Common in temperate region, uncommon in tropics; 38 species, but some Antillean "species" are best regarded as insular subspecies. Southern Canada through Mexico and Antilles to South America. Revision: Roberts (1972). (couplet 74)

35. ***Agapostemonoides*** Roberts and Brooks: Moderate-sized, andreniform; head and thorax bright green; metasoma black to red-brown with basal yellow tergal bands in both sexes, often largely hidden by preceding terga; posterior surface of propodeum enclosed by carina as in *Agapostemon,* dorsal surface over 1.5 times as long as metanotum. Rare; one species, *A. hurdi* Roberts and Brooks. South America to Costa Rica. See Roberts and Brooks (1987). (couplets 67♀ and 73♂)

36. ***Caenohalictus*** Cameron: Small, andreniform; strongly metallic bronze, green, or blue; superficially resembling small Augochlorini. *Caenohalictus* differs from Augochlorini in the tribal characters (couplet 54) and from most Augochlorini in having conspicuously hairy eyes. Rare; few species in our area. Neotropical, abundant in temperate South America and Andes, ranging north to San Luis Potosí and Nayarit. Revision: None. (couplets 68♀ and 72♂)

37. ***Dinagapostemon*** Moure and Hurd: Rather large, andreniform, with hairy eyes; females not brilliantly metallic; male flagellar segments each arched, so that flagellum appears strongly crenulate. Rare; six species. Highlands, Colombia, Central America, and Mexico north to Tamaulipas. Revision: Roberts and Brooks (1987). (couplets 69♀ and 73♂)

Dinagapostemon is perhaps best considered a subgenus of *Paragapostemon.*

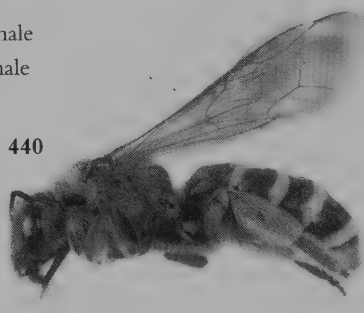
38. ***Habralictus*** Moure: Small to minute; females andreniform; males with basal metasomal segments long and slender, so that metasoma is petiolate as in *Neocorynura;* head and thorax minutely sculptured, rather dull, brassy or strongly metallic green; metasoma nonmetallic, in female flattened, usually with yellow integumental bands or lateral spots. Rare in our area (common in some South

437

438

Figs. 437 and 438. *Agapostemon femoratus* Crawford, male (10 mm) and female (11 mm).

439



440

Figs. 439 and 440. *Halictus* (*Halictus*) *farinosus* Smith, male (12 mm) and female (13 mm).

American countries); few species. Neotropical, ranging north in tropics to Jalisco. Revision: None. (couplet 74)

39. ***Halictus*** Latreille: Small to rather large, andreniform [Figs. 439 and 440], weakly metallic greenish or not metallic. Differs from *Lasioglossum* females and some males in strong distal venation of forewing (couplet 55); unlike *Lasioglossum,* both sexes have apical (not basal) pale tergal hair bands. Common; 10 species. Canada through whole U.S.A. and Mexico to Central America and Antilles, continuing into South America (holarctic and African). Nearly all our species are primitively eusocial. Subgenera: *Halictus* Latreille s.str. (nonmetallic, moderate-sized to rather large) and *Seladonia* Robertson (dull green, small to moderate-sized). Revisions: Sandhouse (1941); Wille and Michener (1971), tropical species. (couplet 56)

Additional subgeneric names have been used for species of *Halictus* s.str. by Pesenko (1984). Of these, *Prohalictus* Pesenko, *Nealictus* Pesenko, and *Odontalictus* Robertson occur in North America.

40. ***Lasioglossum*** Curtis: Minute to moderate-sized, andreniform [Figs. 441 and 442], males often slender; black or dull green or blue, in Antilles rarely bright green; metasoma sometimes red but usually not. Weakened distal veins of forewing (couplets 55, 185) characteristic only of this genus and the derivative genus (or subgenus) *Paralictus*. Weakening of veins often not or scarcely perceptible in males; such males run to couplets 62 and 64. Basal tergal bands or basal lateral patches of pale hair (tomentum) commonly present and pale hair may spread over much of tergal surface; apical bands, such as occur in *Halictus,* are not found in American *Lasioglossum*. Abundant, the most common genus of bees in most north temperate localities; in U.S.A. and Canada about 280 species, perhaps 200 more in Mesoamerica and Antilles. Boreal to tropical (cosmopolitan). Both solitary and eusocial species are included in the subgenera *Dialictus* and *Evylaeus*. A few species of *Dialictus* nest in rotting wood. Subgenera: *Dialictus* Robertson (= *Chloralictus* Robertson), *Evylaeus* Robertson, *Habralictellus* Moure and Hurd, *Hemihalictus* Cockerell, *Lasioglossum* Curtis s.str., *Sphecodogastra* Ashmead. Revisions: McGinley (1986), subgenus *Lasioglossum* s.str.; other subgenera, none. (couplets 55, 62, 64, and 185)

The great majority of species have three submarginal cells and run to couplets 55, 62, or 64, but a few species (in subgenera *Dialictus* and *Hemihalictus*) have two submarginal cells and run to 185. Some authors include the genus *Lasioglossum* in *Halictus*. Others (e.g., Mitchell 1960; Hurd 1979) have accorded generic rank to each subgenus because of the large number of species in *Lasioglossum* s.str., *Dialictus,* and *Evylaeus*. Unfortunately for this concept, *Dialictus* and *Evylaeus* as presently constituted differ only in color and intergrade completely. Yet the type species of

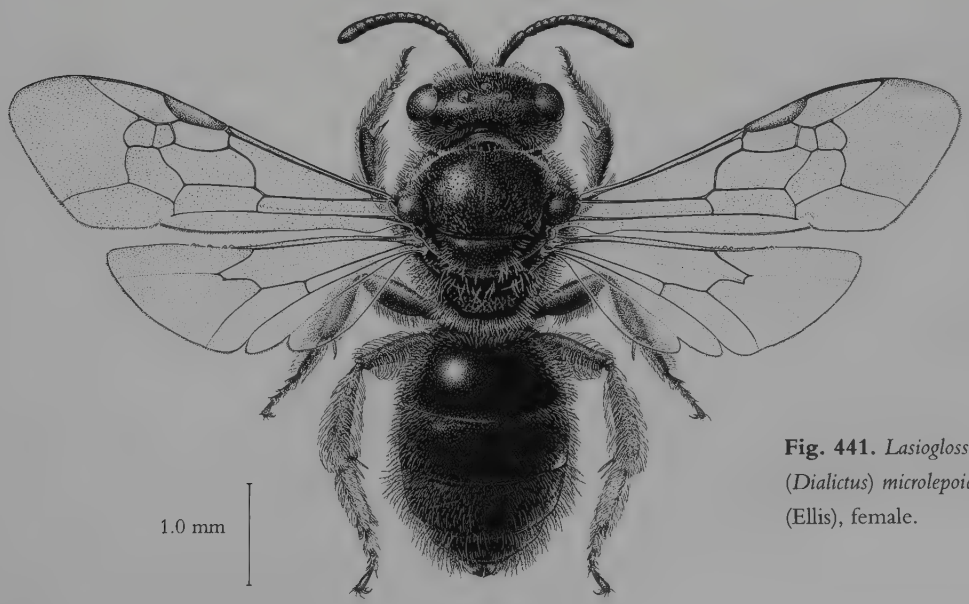


Fig. 441. *Lasioglossum* (*Dialictus*) *microlepoides* (Ellis), female.

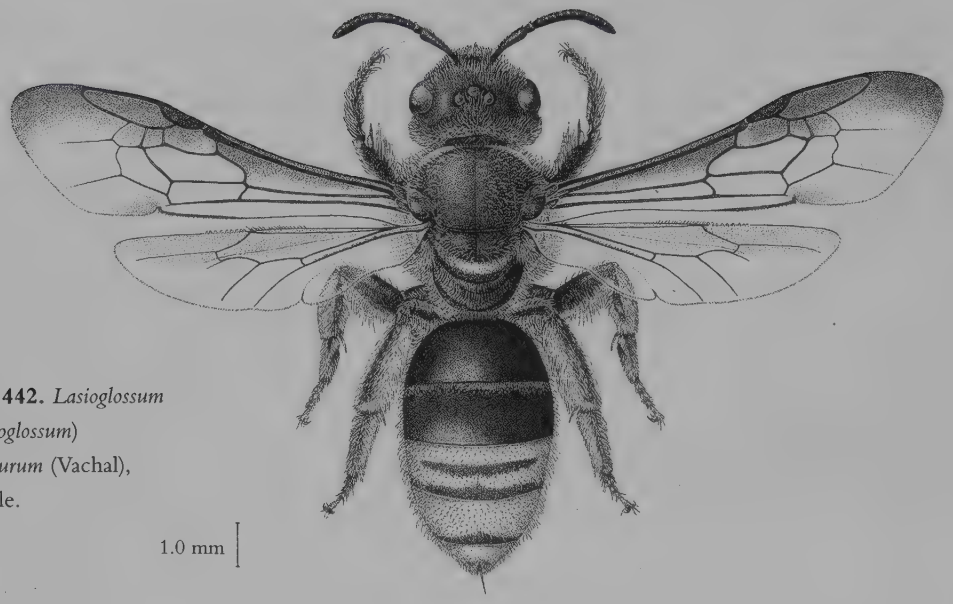


Fig. 442. *Lasioglossum* (*Lasioglossum*) *crocoturum* (Vachal), female.

1.0 mm

Evylaeus and related species are quite different from *Dialictus*. A new and more natural way of dividing this group may result by placing some of the small black species of *Evylaeus* into *Dialictus;* so far such a division has eluded bee systematists. The following is a key to the subgenera.

a. Second transverse cubital vein as strong as first, stronger than third (moderate-sized, usually nonmetallic but some species greenish) ..... *Lasioglossum* s.str.

— Second transverse cubital vein weaker than first, more like third, or rarely absent (this character frequently works only for females) ..... b

b(a). Greenish or bluish, sometimes brassy (minute to small, a few almost moderate-sized) ..... e

— Nonmetallic c

c(b). Femoral scopa a row of simple bristles; ocelli of some species enlarged (moderate-sized, collects pollen from Onagraceae) ..... *Sphecodogastra*

— Femoral scopa of scattered branched hairs; ocelli normal ..... d

d(c). Two submarginal cells; male with body shaped like that of female and antennae short as in female (moderate-sized, collects pollen from *Pyrrhopappus*) ..... *Hemihalictus*

— Three submarginal cells; male usually slender, with longer antennae (minute to moderate-sized) ..... *Evylaeus*

e(b). Head and thorax brilliant green and granular or smooth, usually nearly or completely impunctate (Antilles) ..... *Habralictellus*

— Head and thorax dull greenish or bluish, sometimes brassy; if brilliant green (one Antillean species), strongly punctate and not granular (widespread) ..... *Dialictus*

Most species of *Dialictus* have three submarginal cells and were once placed in *Chloralictus* Robertson. The two-celled and three-celled species are very similar, and one West Indian species may have either two or three cells, sometimes on either wing of the same specimen. *Chloralictus* is obviously a synonym of *Dialictus*.

The subgenera *Habralictellus, Hemihalictus,* and *Sphecodogastra* are small (about 10, 1, and 8 species, respectively); the other subgenera are large.

41. ***Mexalictus*** Eickwort: Small, slender andreniform, greenish (sometimes scarcely so); integument dull, finely roughened. Resembles rather large, slender species of *Lasioglossum* (*Dialictus*) but differs in strong wing venation

and serrate rather than pectinate inner hind tibial spur of female. Rare; three named and three unnamed species. Chiapas to southern Arizona at rather high altitudes. Revision: Eickwort (1978). (couplets 60♀ and 63♂)

42. ***Microsphecodes*** Eickwort and Stage: Similar to minute *Sphecodes* in appearance, including red metasoma; sculpturing weaker than usual in *Sphecodes*. Rare; five or six species. Widespread in neotropical region, not reported north of Costa Rica and Lesser Antilles but specimens of a new species seen from Mexico. Cleptoparasites in nests of other small Halictini, viz. *Lasioglossum* (*Dialictus*) and *Habralictus*. Revision: None. (couplet 53)

It is likely that *Microsphecodes* should be included in the genus *Sphecodes*.

43. ***Paragapostemon*** Vachal: Rather large, andreniform, brilliantly metallic green with hairy eyes and, in the male, enlarged hind legs. Differs from large green Augochlorini not only in tribal characters (couplet 54) but in long hairs of eyes. Rare; one species, *P. coelestinus* (Westwood). Highlands, Oaxaca to Nuevo León. Revision: Roberts and Brooks (1987). (couplets 69♀ and 71♂)

44. ***Paralictus*** Robertson: Like *Lasioglossum* subgenus *Dialictus* in small size, dull green coloration, and weakened second and third transverse cubital veins at least in females. Females differ from *Dialictus* by cleptoparasitic habits, reduction or near loss of scopa, and large sickle-shaped mandibles. Males scarcely and perhaps not reliably distinguishable from *Dialictus* (see couplet 64). Cleptoparasites of *Lasioglossum* (*Dialictus*). Rather rare; five species. Eastern half of U.S.A. and an undescribed species from Arizona; probably reaches northern Mexico. Revision: Mitchell (1960). (couplets 51♀ and 64♂)

No doubt derived from *Dialictus* and perhaps best included in that group.

45. ***Ptilocleptis*** Michener: Small, andreniform. Although related to *Sphecodes,* body is black and extensively covered with pale plumose hair; surface is less coarsely sculptured than usual in *Sphecodes*. Very rare; two species. Widespread in neotropics, north to Nuevo León. Cleptoparasite; hosts unknown. Revision: Michener (1978). (couplet 52)

Possibly best considered an aberrant group of *Sphecodes*. A species from Queretaro that probably falls here lacks the covering of pale hair and has a partly red metasoma, resembling ordinary *Sphecodes*.

46. ***Rhinetula*** Friese: Moderate-sized, andreniform [Fig. 443], scarcely metallic, with hairy eyes; related to *Paragapostemon*. Propodeum wholly declivous. Rare; one species, *R. denticrus* Friese. Peru to Honduras, lowland forests. See Roberts and Brooks (1987). (couplets 66♀ and 71♂)

47. ***Sphecodes*** Latreille: Minute to moderate-sized, sparsely haired, andreniform [Fig. 444]; black with metasoma partly or wholly red in females and many males; terga shiny, without hair bands; punctation of most species very coarse, as is pitting at base of propodeum. Extremely broad head (couplet 52) is distinctive. Common in temperate regions, uncommon in tropics; nearly 80 species north of Mexico, 16 species known in Mesoamerica but there must be many more. Boreal to tropical, Canada to Panama and Antilles (cosmopolitan). Cleptoparasites in nests of other Halictinae, less commonly in nests of *Andrena* and *Perdita*. Revision: None. (couplets 53♀, 57♂, and 185)

Most species have three submarginal cells, but a few have only two (couplet 185). Several groups appear to be subgenerically distinct, but the subgenera remain unresolved.

Fig. 443. *Rhinetula denticrus* Friese, female (12 mm).

Fig. 444. *Sphecodes* sp., female (9 mm).

445

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Figs. 445 and 446. *Nomia melanderi* Cockerell, male (13 mm) and female (12 mm).

447

448

Figs. 447 and 448. *Dufourea calochorti sculleni* (Cockerell), male (9 mm) and female (8 mm).

Nomiinae

48. ***Dieunomia*** Cockerell: Moderate-sized to large, andreniform, usually with apical tergal hair bands, without colored integumental bands; metasoma sometimes partly or wholly red. Common in central and southwestern U.S.A., elsewhere uncommon; nine species. Southern Canada, U.S.A. except northeast, south to Jalisco. Subgenera: *Dieunomia* Cockerell s.str., *Epinomia* Ashmead. Revision: Cross (1958), subgenus *Epinomia*. (couplet 36)

This genus has ordinarily been included in *Nomia*. In both North America and the Old World, however, the diversity seems to justify more than one genus in the Nomiinae.

49. ***Nomia*** Latreille: Moderate-sized to large, apiform or andreniform [Figs. 445 and 446], somewhat hairy; terga without hair bands, with apical, hairless, blue, green, or yellowish integumental bands. Common, western U.S.A., elsewhere in our area uncommon; nine species. U.S.A. except the northeast, south to Veracruz and Guerrero, not or scarcely in tropics; Antilles (cosmopolitan except South America). Subgenera: *Acunomia* Cockerell, *Curvinomia* Michener; *Nomia* s.str. is Asiatic. Revision: Ribble (1965). (couplet 36)

Nomia and *Dieunomia* can be run through either couplets 35 or 121 in "Key to the Genera," because it is difficult to decide on the proper course at couplet 26.

Rophitinae (synonym: Dufoureinae)

50. ***Conanthalictus*** Cockerell: Small to minute, andreniform, blackish or greenish, with dull, minutely roughened, scarcely punctate integument. Rather uncommon; 13 species. Texas to California and Baja California Norte, principally on flowers of Hydrophyllaceae. Subgenera: *Conanthalictus* Cockerell s.str., *Phaceliapis* Michener. Revision: Timberlake (1961). (couplet 40)

51. ***Dufourea*** Lepeletier: Small to moderate-sized, andreniform [Figs. 447 and 448] to slender andreniform, black to metallic bluish or greenish, rarely with red metasoma, sometimes with pale tergal hair bands. Not uncommon in western and central U.S.A., elsewhere rare; about 80 species, only 16 species known from Mexico. Southern Canada, U.S.A., Mexican desert and plateau south to

Oaxaca (holarctic). Subgenera: *Dufourea* Lepeletier s.str., *Halictoides* Nylander. Revision: None. (couplet 188)

Most North American species are placed in the subgenus *Halictoides,* a few in *Dufourea* s.str. These two subgenera are often regarded as generically distinct. *Halictoides* itself is a diversified group, however, and names like *Betheliella* Cockerell, *Cryptohalictoides* Viereck, *Mimulapis* Bridwell, *Neohalictoides* Viereck, *Conohalictoides* Viereck, and others may be resurrected at the subgenus level by subsequent authors. Other subgenera such as *Trilia* occur in the palearctic region. The two American subgenera that often receive generic status are separable thus:

a. S1–S6 of male unmodified ..... *Dufourea* s.str.
— S6 and frequently other sterna of male with projecting lobes or other noteworthy modifications..... .....*Halictoides*

52. ***Michenerula*** Bohart: Small, andreniform, without tergal hair bands. Rare; one species, *M. beameri* Bohart. Texas to Arizona and presumably northern Mexico. Bohart (1965) gave an account of the genus. (couplet 189)

53. ***Micralictoides*** Timberlake: Small to minute, andreniform, sometimes with red metasoma, without tergal hair bands. Uncommon; three or four species. Southern California and no doubt northern Baja California. Revisions: Bohart (1942); Bohart and Griswold (1987). (couplet 189)

54. ***Protodufourea*** Timberlake: Smallish, andreniform. Rare; five species. California and Arizona, may occur in Baja California. Revision: Timberlake (1955a). (couplet 39)

55. ***Sphecodosoma*** Crawford: Minute, andreniform, commonly with red metasoma in females. Rare; two species. Texas to southern California and northern Mexico. Revision: Timberlake (1961), as subgenus of *Conanthalictus.* (couplet 40)

56. ***Xeralictus*** Cockerell: Small, andreniform, blackish or partly reddish. Rare; two species. Deserts of California, Nevada, and Baja California. Usually found in flowers of certain species of *Mentzelia.* Revision: None. (couplet 37)

Placement in the Rophitinae is tentative.

Family Melittidae

Glossa short, pointed, without flabellum. Labial palpus with segments similar, none of them elongate and sheathlike. Mentum elongate, sclerotized, tapering basally; lorum Y-shaped, basal arms slender as in long-tongued bees; mentum and lorum forming long lobe projecting behind proboscis when proboscis is folded. One subantennal suture. Facial fovea absent.

CLASSIFICATION

Subfamily Dasypodinae (*Hesperapis*)
Subfamily Melittinae (*Macropis, Melitta*)

GENERIC STUDIES. A generic review of the family is by Michener (1981). This family is most diverse in Africa and does not occur in South America and Australia.

Dasypodinae

57. ***Hesperapis*** Cockerell: Small to moderate-sized, andreniform, usually with tergal hair bands; metasoma especially of female very flat and integument soft, rarely red. Differs from superficially similar commoner genera like *Andrena, Halictus, Lasioglossum,* and *Colletes* by scopa on tibia, not on basal parts of hind legs. Not uncommon; about 25 species. Western and central U.S.A., north to North Dakota (but absent from northeastern and northwestern states), east to Florida, south to Morelos and Puebla. Subgenera: *Amblyapis* Cockerell, *Carinapis* Stage, *Disparapis* Stage, *Hesperapis* Cockerell s.str., *Panurgomia* Viereck, *Xeralictoides* Stage, *Zacesta* Ashmead (see Michener 1981). Revision: None. (couplet 194)

Xeralictoides is included as a subgenus although it was proposed as a genus (Stage, in Michener 1981).

Melittinae

58. ***Macropis*** Panzer: Small to moderate-sized, robust andreniform [Fig. 449], with shiny black metasoma and limited pale hair bands. Uncommon; four species. Eastern and central U.S.A. and southern Canada, west to Washington state (holarctic). Oligolectic on *Lysimachia.* Our

species are in the subgenus *Macropis* s.str. Revision: Michener (1938d). (couplet 194)

59. ***Melitta*** Kirby: Moderate-sized, andreniform [Fig. 450], with tergal hair bands. Appearance like that of moderate-sized, nonmetallic *Andrena,* differing by lack of trochanteral and femoral scopa and of facial foveae in the female. Rare; four species. Eastern U.S.A. and deserts of Arizona, California, and Baja California (holarctic and African). Subgenera: *Dolichochile* Viereck and *Melitta* Kirby s.str. Revision: None. (couplet 41)

We regard *Dolichochile* as an aberrant *Melitta,* although Michener (1981) considered it a distinct genus. It differs from *Melitta* by the two-segmented instead of six-segmented maxillary palpi of both sexes and the bladelike mandible of the female, slightly longer than the eye and edentate.

Fig. 449. *Macropis patellata* Patton, female (8 mm).

Fig. 450. *Melitta tricincta* Kirby, male (9 mm).

Family Megachilidae

Glossa long, with flabellum (Michener and Brooks 1984). Labial palpus with first two segments long, flattened, sheathlike, in striking contrast to last two segments, which are small and directed laterally (rarely third segment also flattened). Mentum elongate, sclerotized, tapering basally; lorum Y-shaped or V-shaped, basal arms slender; mentum and lorum forming long lobe projecting behind proboscis when proboscis is folded. One subantennal suture. Facial fovea absent. Labrum longer than broad and widened to broad articulation with clypeus. Two submarginal cells in forewing, usually about equal in length. Pygidial plate usually absent.

451

452

Figs. 451 and 452. *Lithurge apicalis* (Cresson), male (12 mm) and female (15 mm).

CLASSIFICATION

Subfamily Lithurginae (*Lithurge*)
Subfamily Megachilinae
  Tribe Anthidiini (*Anthidiellum* to *Trachusa*)
  Tribe Dioxyini (*Dioxys*)
  Tribe Megachilini (*Coelioxys, Megachile*)
  Tribe Osmiini (*Ashmeadiella* to *Xeroheriades*)

GENERIC STUDIES. For Lithurginae, Michener (1983); for Osmiini, Michener (1941) and see also Hurd and Mich-

ener (1955); for *Megachile* and its relatives, Mitchell (1980); for Anthidiini, Michener (1948) and Griswold and Michener (1988).

Fig. 453. *Anthidiellum* sp., female (10 mm).

Fig. 454. *Anthidium porterae* Cockerell, female (12 mm).

Lithurginae

60. ***Lithurge*** Latreille: Moderate-sized to large, megachiliform [Figs. 451 and 452], females usually and males sometimes with facial prominence at level of upper margin of clypeus. Uncommon; about nine species, plus one introduced species. U.S.A. except northeast (but an introduced species in New Jersey) and northwest, Mexico, Antilles, south to Costa Rica; absent from moist tropics (cosmopolitan). Usually in xeric areas, native species oligolectic on *Opuntia* and similar cacti. Nests in burrows in wood. Revisions: Snelling (1983, 1986b). (couplet 195)

Native American species belong to the subgenus *Lithurgopsis* Fox; the introduced species (which may be extinct in North America), to *Lithurge* Latreille s.str. The generic name is sometimes considered to be *Lithurgus* Berthold.

Megachilinae: Anthidiini

61. ***Anthidiellum*** Cockerell: Moderate-sized, very robust megachiliform [Fig. 453], black or sometimes red with yellow markings. Differs from all other North American anthidiines by short, robust body. Uncommon in western U.S.A., otherwise rare; probably eight species. Southern British Columbia, all parts of U.S.A. and Mesoamerica, including the tropics (cosmopolitan except Australia, depending on generic limits). Nests of resin constructed in the open. Subgenera: Our species are in *Anthidiellum* s.str. Revisions: Schwarz (1926b), U.S. and Canadian species; Grigarick and Stange (1968), Californian species. (couplet 212)

62. ***Anthidium*** Fabricius: Moderate-sized to large, broad-bodied, rather squarish megachiliform [Fig. 454], with yellow markings, usually extensive. The multiple, close-set mandibular teeth of the female distinguish this genus from all others in our area. Common in western North America, elsewhere uncommon; 27 species in U.S.A. and Canada, a few others in Mesoamerica. Canada, probably Alaska, south through western and central U.S.A. to Texas and through Mesoamerica (cosmopolitan except Australia). Nest cells of plant hairs in small cavities in wood, in stems, in or between stones, or in soil. Subgenera: *Anthidium* Fabricius s.str., *Callanthidium* Cockerell. Revisions: Schwarz (1927), U.S. and Canadian species; Grigarick and Stange (1968), Californian species. (couplet 208)

Callanthidium has usually been regarded as a separate genus of two species. It differs from *Anthidium* s.str. in the large median emargination of T6 of the female and in having the second recurrent vein usually distad of the second transverse cubital by several vein widths. *Melanthidium* contains two aberrant species and has recently been synonymized with *Anthidium* (Griswold and Michener 1988).

63. ***Anthodioctes*** Holmberg: Small to moderate-sized, megachiliform (subgenus *Anthodioctes* s.str.) or heriadiform (subgenus *Nananthidium*), with yellow markings, unusually coarse sculpturing, and strong carinae. Uncommon; less than a dozen species. Neotropics, ranging into arid subtropics of Mexico, north to Tamaulipas, Chihuahua, and Sinaloa. Nests probably in small cavities in wood, stones, and so forth. Subgenera: *Anthodioctes* Holmberg s.str., *Nananthidium* Moure. Revision: None. (couplet 217)

The subgenus *Nananthidium* has had generic status but seems to differ principally in smaller size and more slender form from *Anthodioctes* (Griswold and Michener 1988).

455

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Figs. 455 and 456. *Aztecanthidium tenochtitlanicum* Snelling, male (15 mm) and female (16 mm).

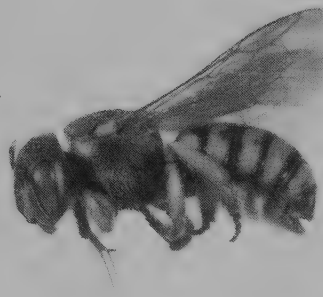

Fig. 457. *Dianthidium ulkei* (Cresson), female (8 mm).

Fig. 458. *Dolichostelis laticincta* (Cresson), female (8 mm).

64. ***Aztecanthidium*** Michener and Ordway: Large, rather elongate megachiliform [Figs. 455 and 456], black or red with limited yellow or whitish markings. Uncommon; three species. Morelos to Nayarit. Revisions: Michener and Ordway (1964); Snelling (1987). (couplet 216)

65. ***Dianthidium*** Cockerell: Small to moderate-sized, rarely large (*Mecanthidium*), megachiliform [Fig. 457], yellow to white and black, or in *Mecanthidium* often red. T7 of male curled under, usually with small, short, blunt or truncate median lobe and broad lateral lobes, but in some of subgenus *Adanthidium,* tergal margin scarcely lobate or median lobe longest, and in the subgenus *Mecanthidium,* median lobe enormously elongate and lateral lobes almost absent. Common in western U.S.A., elsewhere uncommon; 28 species. North America from southern Canada southward to Chiapas. Nests of pebbles and resin, on stones or tree branches or in cavities in soil. Subgenera: *Adanthidium* Moure, *Deranchanthidium* Griswold and Michener, *Dianthidium* Cockerell s.str., *Mecanthidium* Michener. Revisions: Schwarz (1926b), Timberlake (1943), Grigarick and Stange (1968); all relate primarily to species of *Dianthidium* s.str. found north of Mexico. (couplets 209 and 214)

Dianthidium comes out twice in the key because of differences among subgenera in the presence or absence of arolia. Given that *Mecanthidium* may warrant generic recognition, and *Adanthidium* has been regarded as a genus, the subgenera are separated by the following key, modified from that of Griswold and Michener (1988):

a. Hind coxa with elongate ventral apical spine in male, with short tooth (best seen in lateral view) in female; hypostomal area dulled by fine, dense punctation ..... *Dianthidium* s.str.

— Hind coxa without tooth or spine; hypostomal area shiny between punctures ..... b

b(a). Arolia present; mouthparts in repose considerably exceeding proboscidial fossa c

— Arolia absent; mouthparts in repose scarcely exceeding proboscidial fossa (male S5 without apical sclerotized comb) ..... *Deranchanthidium*

c(b). Male S5 with apical sclerotized comb; female mandible short, length considerably less than maximum clypeal width..... *Adanthidium*

— Male S5 without apical sclerotized comb; female mandible long, length equal to maximum clypeal width ..... *Mecanthidium*

66. ***Dolichostelis*** Parker and Bohart: Smallish to moderate-sized, heriadiform [Fig. 458], black with extensive yellow markings. Uncommon to rare; six species. Southern U.S.A. (California and Utah to Florida) through Mexico to Costa Rica; present in both xeric and humid areas. Cleptoparasitic on *Megachile*. Revision: Parker and Bohart (1979). (couplet 206)

The species have long been included in *Stelis*, being incorrectly attributed to *Protostelis* Friese at the subgenus level. The genus may have arisen independently of *Stelis* from nonparasitic anthidiines such as *Anthodioctes*.

67. ***Epanthidium*** Moure: Moderate-sized, rather elongate megachiliform, black with yellow or whitish markings, aspect of an *Aztecanthidium*. Rare; one species, *E. boharti* Stange. Nuevo León to San Luis Potosí, Jalisco; other species in southern South America. Nests unknown. Revision: Stange (1983). (couplet 218)

Our species, along with two from South America, belong to the subgenus *Carloticola* Moure and Urban.

68. ***Hoplostelis*** Dominique: Moderate-sized, robust megachiliform, with extensive yellow markings. Rare; perhaps only one species. American tropics, including those of Mexico. Cleptoparasites of euglossine bees. Revision: None. (couplet 211)

Until recently this genus has been called *Odontostelis* Cockerell; see Griswold and Michener (1988).

69. ***Hypanthidiodes*** Moure: Small to moderate-sized, megachiliform, yellow and black, resembling small *Dianthidium, Hypanthidium,* and *Anthodioctes*. This genus appears twice in the key because the arolia are variable, usually absent in females and usually present in males, although in one of our subgenera they are absent in both sexes. Rare; a few species. American tropics, north to Chiapas. Subgenera: *Anthidulum* Michener (north to Costa Rica), *Saranthidium* Moure and Hurd. Revision: None. (couplets 210 and 218)

The subgenera *Hypanthidiodes* Moure s.str. and *Dichanthidium* are South American. Placement of *Saranthidium* in *Hypanthidiodes* is a new status. The relationship was suggested by Griswold and Michener (1988), but R. W. Brooks and A. Roig-Alsina (pers. comm. 1991) argued for uniting all four subgenera listed above under *Hypanthidiodes*.

Because our subgenera are sometimes regarded as generically distinct, we differentiate them as follows:

a. Arolia absent in both sexes; subantennal suture straight; S2 of male not enlarged; S5 of male with apical sclerotized comb ..... *Saranthidium*

— Arolia absent in female, present in male; subantennal suture arcuate; S2 of male enlarged, following sterna largely hidden; S5 of male without apical comb ..... *Anthidulum*

70. ***Hypanthidium*** Cockerell: Moderate-sized, megachiliform, yellow and black, similar in aspect to *Anthodioctes* but less coarsely sculptured. Uncommon; seven species. Neotropical, including tropical Mexico north to Tamaulipas and Sonora. Nests unknown. Revision: None. (couplet 210)

71. ***Paranthidium*** Cockerell and Cockerell: Moderate-sized, megachiliform, yellow to white and black, resembling *Dianthidium,* apex of male abdomen often strongly curled under. Rare; six species (only two in U.S.A.). Widespread in U.S.A. and Mexico south to Panama. Nest sites unknown. Subgenera: *Paranthidium* Cockerell and Cockerell s.str., *Rapanthidium* Michener. Revision: Schwarz (1926b), U.S. species only. (couplet 213)

72. ***Protostelis*** Friese: Moderate-sized, megachiliform, with extensive yellow markings. Rare; eight species. Southern U.S.A., California to Florida, north to New Jersey, south to Jalisco and Morelos. Cleptoparasites of *Trachusa* and perhaps other anthidiines. Revision: Thorp (1966). (couplet 205)

American species have usually been placed under the synonymous name *Heterostelis* Timberlake; see Griswold and Michener (1988).

73. ***Stelis*** Panzer: Small to moderate-sized, megachiliform, black or metallic blue or green, with or without yellow or white metasomal markings. Rare or, in western U.S.A., uncommon; about 55 species. Southern Canada throughout U.S.A., south to the states of Michoacan and Oaxaca (holarctic). Cleptoparasites on anthidiine and os-

miine bees. Subgenera: *Chelynia* Provancher, *Melanostelis* Ashmead, *Microstelis* Robertson, *Pavostelis* Sladen, *Stelidina* Timberlake, *Stelidium* Robertson; *Stelis* s.str. is palearctic. Revision: None. (couplets 206 and 219)

This genus appears twice in the key because of the presence or absence of pale metasomal maculations.

74. ***Trachusa*** Panzer: Moderate-sized to rather large, megachiliform [Fig. 459]; strong carinae absent; propodeal foveae and basal pits absent except that pronotal lobe sometimes has carina or lamella. Not uncommon in southwestern U.S.A., rare elsewhere; 17 species. Central and southern U.S.A., north to New Jersey, Michigan, and South Dakota, south to Jalisco, Puebla, and Veracruz; not found in wet tropics (holarctic, oriental, and African). Subgenera: *Heteranthidium* Cockerell, *Legnanthidium* Griswold and Michener, *Trachusomimus* Popov, *Ulanthidium* Michener; *Trachusa* s.str. is palearctic. Revisions: For *Heteranthidium,* Schwarz (1926a), Snelling (1966a), and Brooks and Griswold (1988); for *Trachusomimus,* Thorp (1963) and Grigarick and Stange (1968). (couplets 216 and 220)

Because one subgenus is marked with abundant yellow markings that are reduced or lacking in the others, this genus appears twice in the key. Some of the subgenera have until recently (Griswold and Michener 1988) been given generic status. They differ as follows:

a. Head, thorax, and metasoma richly marked with cream color or yellow; colored bands on terga preapical; tergal hair bands absent (arolia usually present but often extremely small, sometimes absent) ..... *Heteranthidium*

— Yellow or cream markings absent except on face of male and sometimes narrow apical tergal bands; metasoma hairy or with apical tergal hair bands, at least laterally ..... b

b(a). Arolia absent ..... *Ulanthidium*

— Arolia present c

c(b). Metasoma without pale integumental bands, with pale apical hair bands; S8 of male with broad disc, ending in trilobed, hairy apex ..... *Trachusomimus*

— Metasomal terga with narrow, pale apical borders, sometimes faint or absent; hair bands present only laterally; S8 of male with disc a transverse and almost hairless band, apex concave ..... *Legnanthidium*

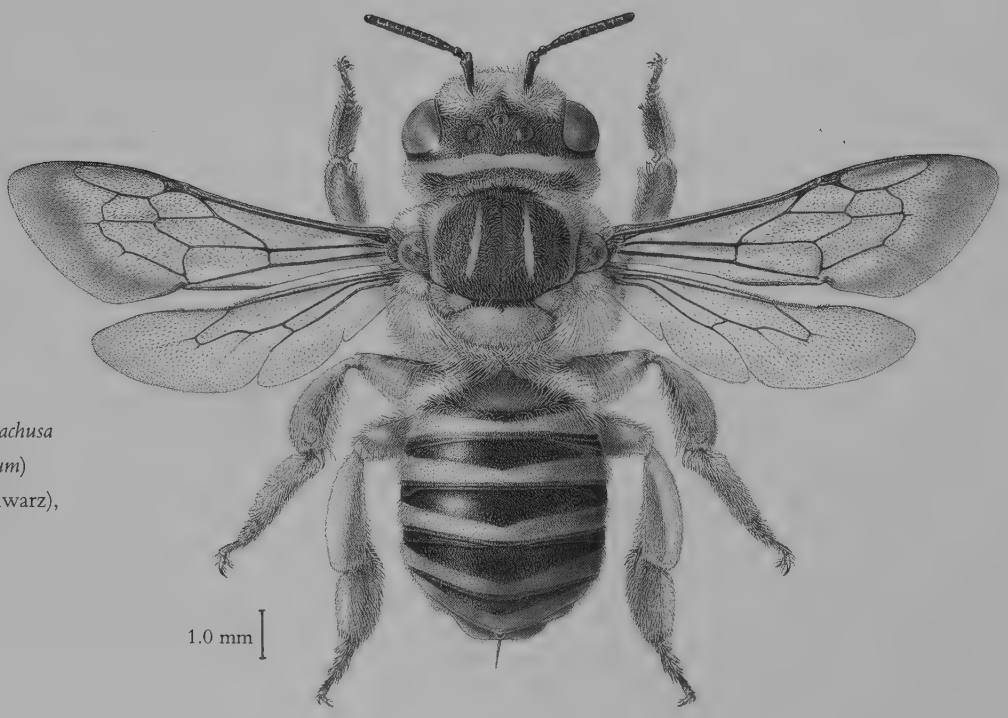

Fig. 459. *Trachusa* (*Heteranthidium*) *bequaerti* (Schwarz), female.

Megachilinae: Dioxyini

75. ***Dioxys*** Lepeletier and Serville: Moderate-sized, megachiliform [Figs. 460 and 461]; metasoma tapering to blunt apex, often red, terga with narrow apical bands of pale hair. Rare; five species. Western half of U.S.A., Baja California, and presumably elsewhere in northern Mexico (holarctic). Cleptoparasites of Megachilinae. Subgenera: Our species all belong to *Dioxys* s.str. Revision: Hurd (1958). (couplet 182)

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Figs. 460 and 461. *Dioxys productus cismontanicus* Hurd, male (7 mm) and female (7 mm).

Megachilinae: Megachilini

76. ***Coelioxys*** Latreille: Moderate-sized, megachiliform [Fig. 462], with metasoma tapering apically, in female to sharp point, in male to several teeth; metasomal terga rarely red, usually with transverse basal grooves and narrow white hair bands. Not uncommon; 45 species in U.S.A. and Canada, at least 43 additional species in Antilles and Mesoamerica (T. L. Griswold, pers. comm. 1991). Boreal to tropical regions (cosmopolitan). Cleptoparasites of *Megachile;* in other continents reported also on *Anthophora* and *Centris*. Subgenera: *Acrocoelioxys* Mitchell, *Boreocoelioxys* Mitchell, *Coelioxys* Latreille s.str., *Cyrtocoelioxys* Mitchell, *Dasycoelioxys* Mitchell, *Glyptocoelioxys* Mitchell, *Haplocoelioxys* Mitchell, *Melanocoelioxys* Mitchell, *Neocoelioxys* Mitchell, *Platycoelioxys* Mitchell, *Rhinocoelioxys* Mitchell, *Schizocoelioxys* Mitchell, *Synocoelioxys* Mitchell, *Xerocoelioxys* Mitchell. Revision: Baker (1975), several subgenera, U.S.A. and Canada; see also Mitchell (1973). (couplet 182)

Fig. 462. *Coelioxys alternata* Say, female (14 mm).

77. ***Megachile*** Latreille: Small to large megachiliform [Figs. 463 and 464] or sometimes heriadiform [Fig. 465], usually with pale tergal hair bands. Common; 139 species north of Mexico, many additional species in Mexico and Central America. Canada through U.S.A., Mesoamerica, and Antilles, present in all climatic zones (cosmopolitan). Revisions: Mitchell (1934–37), species north of Mexico; Mitchell (1956) and Snelling (1990) for subgenus *Chelostomoides;* for Mesoamerica, none except for *Chelostomoides,* but see Mitchell (1930, 1943). (couplet 221)

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Figs. 463 and 464. *Megachile* (*Xanthosarus*) *latimanus* Say, male (13 mm) and female (15 mm).

Michener (1962) divided the bees commonly included in the genus *Megachile* into two major genera: *Chalicodoma* and *Megachile*. In this sense, *Chalicodoma* included forms

Fig. 465. *Megachile* (*Chelostomoides*) *occidentalis* Fox, female.

that make cells of mud or resin and lack cutting edges between the mandibular teeth of the female, and *Megachile* included those that make cells of leaf pieces and possess such cutting edges. In a general way the thoracic characters listed by Michener (1962) support this division, but each of them varies. The male sternal character (three exposed sterna versus four) is useful in the Western Hemisphere except for a few introduced species, but elsewhere it does not distinguish the two major genera. Thus the distinction between these genera must be abandoned; all the species are here placed in *Megachile*.

Mitchell (1980) divided *Megachile* s.l. into seven genera, all of which occur within our area. These genera are often difficult or impossible to separate, and we do not follow Mitchell in recognizing the seven taxa at the genus level; some of them do not represent natural groups. The following key to the seven groups is modified from that of Mitchell (1980).

a. S6 of female with apical half bare except for row of short, preapical hairs behind which is bare apical lip; midtibial spur of male much reduced or absent..... ..... Group 1, *Pseudocentron*

— S6 of female either well clothed with scopal hairs *or* without bare apical lip, or if a lip is present, it is directed upward; midtibial spur of male well developed except rarely absent if middle basitarsus is much modified or swollen beneath .....b

b(a). Form usually elongate, metasoma parallel-sided, terga strongly convex transversely; mandible of female without cutting edges between teeth or with only short cutting edge in second interspace (i.e., between teeth 2* and 3); S4 of male often retracted beneath S3 or, *if* S4 exposed, *then* mandible without ventral process.....c

— Form broad, metasoma rather cordate or ovate in female, terga somewhat flattened, less convex; mandible of female usually with cutting edge in uppermost interspace and often in others; S4 of male exposed .....d

c(b). Mandible of female usually with cutting edge incompletely filling second interspace; if female mandible not so, then clypeus much modified; mandible

*The lowermost, or apical, tooth, is number 1.

of male with three teeth, usually with basal or submedian ventral process; *if* process absent, *then* mandible much elongated; S8 of male not fringed laterally ..... Group 2, *Eumegachile*

— Mandible of female without cutting edges, with three or four teeth; mandible of male with three or four teeth, without ventral process; S8 of male fringed laterally (males of native American forms with only three exposed metasomal sterna)..... ..... Group 3, *Chalicodoma*

d(b). Mandible of female four- or five-toothed, usually without cutting edges; mandible of male usually without ventral process; first coxa of male with well-developed apical spine ....Group 4, *Chrysosarus*

— Mandible of female three- to five-toothed, with cutting edge at least in uppermost interspace; mandible of male with lower basal process or, if not, front coxa without spine .....e

e(d). Mandible of female four-toothed, upper apical angle usually blunt or truncate, second interspace wide, usually with distinct cutting edge; mandible of male without ventral process; front tarsus of male usually not expanded..... Group 5, *Cressoniella*

— Mandible of female three- to five-toothed, upper apical angle usually acute; second interspace of female mandible, in those with four teeth, narrow with only vestigial cutting edge; mandible of male with well-developed ventral basal process; front tarsus of male usually dilated and brightly colored ... f

f(e). T6 of male with transverse, often crenulate or multispinose carina (superficially, apex of metasoma) usually without median emargination, its upper surface straight or slightly convex in profile; T6 of female nearly straight in profile; mandible of female three-toothed with long cutting edge in second interspace *or* apex of S6 thickened or produced above an apical fringe of short hairs *or* mandible four-toothed with second interspace very small, upper apical angle acute ..... Group 6, *Megachiloides*

— T6 of male with transverse carina usually emarginate in the middle, sometimes emargination obscured by crenulations or spines, upper surface of carina at an angle to disc of tergum to form concave profile; T6 of female usually concave in profile; mandible of female four- or five-toothed, apex of S6 not thickened or produced; if female mandible four-toothed, then second interspace larger, usually with partial cutting edge, or upper apical angle truncate or blunt .....Group 7, *Megachile*

Subgenera: Group 1, *Acentron* Mitchell, *Leptorachis* Mitchell, *Melanosarus* Mitchell, *Moureana* Mitchell, *Pseudocentron* Mitchell. Group 2, *Eumegachile* Friese (not in our area), *Grosapis* Mitchell, *Sayapis* Titus. Group 3, *Chalicodoma* Lepeletier (not in our area), *Chelostomoidella* Snelling, *Chelostomoides* Robertson, and three subgenera introduced into the Antilles (the first two from Africa, the third from Asia is also recorded from southern Florida)—*Callomegachile* Michener, *Carinula* Michener, McGinley and Danforth, and *Pseudomegachile* Friese; another subgenus from Africa, *Gronoceras* Cockerell, was reported from Jamaica. Group 4, *Chrysosarus* Mitchell. Group 5, *Austromegachile* Mitchell, *Cressoniella* Mitchell, *Holcomegachile* Mitchell, *Neomegachile* Mitchell, *Ptilosaroides* Mitchell, *Ptilosarus* Mitchell, *Tylomegachile* Moure. Group 6, *Argyropile* Mitchell, *Derotropis* Mitchell, *Megachiloides* Mitchell, *Phaenosarus* Mitchell, *Xeromegachile* Mitchell. Group 7, *Addendella* Mitchell, *Cyphopyga* Robertson, *Delomegachile* Viereck, *Eutricharaea* Thomson (introduced), *Litomegachile* Mitchell, *Megachile* Latreille s.str., *Xanthosarus* Robertson.

Carinula is a replacement name for *Carinella* Pasteels, which is preoccupied (see "Classificatory and Nomenclatural Changes").

Megachilinae: Osmiini

78. ***Ashmeadiella*** Cockerell: Small, robust heriadiform [Figs. 466 and 467], black or with a red metasoma, tergal bands of pale hairs present; anterior surface of first metasomal tergum concave, delimited by carina almost as in *Heriades*. Males readily recognized by four teeth on T6. Common in southwestern U.S.A., elsewhere uncommon or rare; about 55 species. Western North America from southern Canada to Oaxaca and Quintana Roo, especially abundant in xeric areas, rare in tropics and in eastern North America, absent from northeast. Nests in pre-

Fig. 466. *Ashmeadiella (Ashmeadiella) occipitalis* Michener, male (7 mm).

Fig. 467. *Ashmeadiella bucconis* (Say), female (10 mm).

Fig. 468. *Chelostoma californicum* Cresson, male (10 mm).

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Figs. 469 and 470. *Heriades carinata* Cresson, male (6 mm) and female (7 mm).

formed burrows in stems or probably in other small spaces; also in snail shells. Subgenera: *Arogochila* Michener, *Ashmeadiella* Cockerell s.str. (includes *Titusella* Cockerell), *Chilosima* Michener, *Cubitognatha* Michener. Revision: Michener (1939a). (couplet 226)

79. ***Chelostoma*** Latreille: Minute to smallish, unusually slender heriadiform [Fig. 468], with or without very weak tergal hair bands; apex of metasoma of male not tightly curled under, six exposed sterna; sculpturing fine, no series of pits across base of propodeum. Not uncommon in Pacific coast states, rare in central and eastern states; nine species. Pacific coast states, Washington to Baja California, east to Utah; Kansas to Atlantic coast; two additional introduced species, New York State (holarctic). Nests in preformed burrows in wood. Subgenera: *Chelostoma* Latreille s.str., *Prochelostoma* Robertson. Revisions: Michener (1938a,c). (couplets 186 and 227)

The single native eastern and central North American species, *C. philadelphi* (Robertson), has long been put in a separate genus, *Prochelostoma* Robertson (see Michener 1938c), but it is at best subgenerically differentiated. It appears to be a specialized derivative of ordinary *Chelostoma*. Because of difficulty of decision at couplet 183, *Chelostoma* comes out at two places in "Key to the Genera."

80. ***Heriades*** Spinola: Small, heriadiform [Figs. 469 and 470], black with narrow apical white hair bands on terga; anterior surface of T1 concave and delimited by distinct carina; apex of metasoma of male tightly curled under, so that only one to three sterna are exposed; sculpturing conspicuously coarse. Common in U.S.A., less common elsewhere; about 15 species. Canada through U.S.A., Antilles, and Mesoamerica; rare in the tropics as far south as Panama (holarctic, oriental, and African). Nests in preformed burrows in wood. Subgenera: *Neotrypetes* Robertson and *Physostetha* Michener; *Heriades* s.str. is palearctic. Revisions: Michener (1938b, 1954b). (couplet 222)

81. ***Hoplitis*** Klug: Minute to rather large heriadiform [Fig. 471] or megachiliform, often black but sometimes weakly metallic green (subgenus *Hexosmia*) or brilliant green or blue-green (some species, subgenus *Monumetha*); metasoma sometimes red, frequently with tergal pale hair bands. Not uncommon, common in some areas of western U.S.A.; about 95 species. Boreal (northern Canada and Alaska) throughout U.S.A. and south to Puebla in

Mexico (holarctic and African). Nests in preformed burrows in wood or stems, dug into pith, or constructed of pebbles and mud. Subgenera: There are three groups that have sometimes been accorded generic rank—(1) *Alcidamea* Cresson, *Andronicus* Cresson, *Cyrtosmia* Michener, *Dasyosmia* Michener, *Formicapis* Sladen, *Hoplitis* Klug s.str. (introduced from Europe to New York State), *Monumetha* Cresson (including *Chlorosmia* Sladen), *Robertsonella* Titus; (2) *Atoposmia* Cockerell, *Eremosmia* Michener, *Hexosmia* Michener, *Isosmia* Michener and Sokal; (3) *Acrosmia* Michener, *Cephalapis* Cockerell, *Hoplitina* Cockerell, *Penteriades* Michener and Sokal, *Proteriades* Titus, *Xerosmia* Michener. Revisions: Michener (1947), subgenera of group 1; Michener (1943), subgenera of group 2; Timberlake and Michener (1950), subgenera of group 3. See also Hurd and Michener (1955). (couplet 227)

The generic names commonly used for groups 1 through 3 of subgenera are, respectively, *Hoplitis, Anthocopa* (*Anthocopa* Lepeletier and Serville s.str. is palearctic), and *Proteriades*. *Hoplitis* (group 1) differs from *Anthocopa* (group 2) almost only in its heriadiform rather than megachiliform body shape; other described differences are other ways of describing that shape difference or seem to result from it, or are inconstant. The difference between groups 1 and 2 has been useful in North America but breaks down completely in the rich Eurasian and African faunas. Although Michener (1941, 1944) had resurrected *Anthocopa* for group 2 and attempted to show its generic status, he later abandoned efforts to reliably separate *Anthocopa* from *Hoplitis* and united them under the latter name (Michener 1968).

Group 3, *Proteriades,* was long separated from *Hoplitis* and *Anthocopa* by the short mouthparts covered with hooked hairs for obtaining pollen from flowers of *Cryptantha*. However, some *Penteriades* lack such hairs in males. Moreover, the evident close relationship of *Hoplitina* and *Acrosmia* to *Proteriades* resulted in the transfer of the first from *Hoplitis* and the second from *Anthocopa* to *Proteriades* (Michener and Sokal 1957). We know of no strong characters that reliably separate *Proteriades* thus expanded from *Hoplitis-Anthocopa,* and therefore we include *Proteriades* in *Hoplitis*. The only practical alternative would be to recognize each subgenus as a genus; in the palearctic region in particular such a practice would result in an enormous number of genera (about 21). *Ashmeadiella* is a member of the same complex but does not intergrade with *Hoplitis;* at least there are no described intermediates in North America. One could justify the inclusion of its species, also, in the expanded genus *Hoplitis*. *Hoplitis* is closely related to *Osmia,* and in Europe the species of *Hoplitis* are usually included in *Osmia*.

82. ***Osmia*** Panzer: Small to moderate-sized, rarely large, megachiliform [Fig. 472], black or usually metallic (sometimes brilliantly so like chrysidids or *Augochlora*), usually without appreciable tergal hair bands. Common in western North America (rare in deserts), moderately common in east, uncommon in Mexico; about 135 species. Boreal, south through entire U.S.A. and mountains of Mexico to Costa Rica; some desert species in northwestern Mexico and southwestern U.S.A.; absent in tropics (holarctic). Nests in preformed cavities in wood or burrows in stems or soil. Subgenera: *Acanthosmioides* Ashmead, *Centrosmia* Robertson, *Cephalosmia* Sladen, *Chalcosmia* Schmiedeknecht, *Chenosmia* Sinha, *Diceratosmia* Robertson, *Euthosmia* Sinha, *Melanosmia* Schmiedeknecht, *Monilosmia* Robertson, *Mystacosmia* Snelling, *Nothosmia*

Fig. 471. *Hoplitis* (*Dasyosmia*) *biscutellae* (Cockerell), female (11 mm).

Fig. 472. *Osmia* (*Osmia*) *lignaria* Say, female (12 mm).

Ashmead, *Osmia* Panzer s.str., *Trichinosmia* Sinha. Revisions: Michener (1949), *Diceratosmia;* Rust (1974), subgenera *Osmia* s.str., *Chalcosmia* and *Cephalosmia;* Sandhouse (1939), excludes *Diceratosmia* and Mexican species; Sinha and Michener (1958), *Centrosmia;* White (1952), *Acanthosmioides.* (couplet 223)

Osmia is a close relative of *Hoplitis.*

83. ***Protosmia*** Ducke: Small, heriadiform, almost without pale tergal hair bands. Not uncommon; one species, *P. rubifloris* (Cockerell). Pacific coast states of U.S.A. and mountains of Arizona and southern Utah; probably occurs in northern Baja California (holarctic). Michener (1938c). (couplet 225)

The American species was formerly put in its own genus, *Chelostomopsis* Cockerell, which is now considered as a subgenus of the otherwise palearctic *Protosmia.* This relationship was suggested by Popov (1961), and the classificatory change was made by Griswold (1986b).

84. ***Xeroheriades*** Griswold: Small, heriadiform, black with largely reddish metasoma and apical bands of white hair on metasomal terga; anterior surface of T1 convex except for longitudinal depression, not margined by carina. Rare; one species, *X. micheneri* Griswold. Desert mountains of southern California (see Griswold 1986a). (couplet 225)

Family Anthophoridae

Proboscis as described for Megachilidae. One subantennal suture. Facial fovea absent or weakly indicated. Labrum usually broader than long; if not, narrowed basally to short articulation with clypeus. Usually three submarginal cells, uncommonly two or even one; if two, second usually much shorter than first. Scopa, except when absent, on hind tibia; hairs uniformly placed, not forming corbicula. Pygidial plate usually present at least in female.

CLASSIFICATION

Subfamily Anthophorinae
- Tribe Anthophorini (*Anthophora* to *Habropoda*)
- Tribe Centridini (*Centris, Ptilotopus*)
- Tribe Emphorini (*Diadasia* to *Ptilothrix*)
- Tribe Ericrocidini (*Acanthopus* to *Mesoplia*)
- Tribe Eucerini (*Agapanthinus* to *Xenoglossa*)
- Tribe Exomalopsini (*Ancyloscelis* to *Paratetrapedia*)
- Tribe Melectini (*Brachymelecta* to *Zacosmia*)
- Tribe Osirini (*Epeoloides* to *Protosiris*)
- Tribe Protepeolini (*Leiopodus*)
- Tribe Rhathymini (*Rhathymus*)
- Tribe Tetrapediini (*Coelioxoides, Tetrapedia*)

Subfamily Nomadinae
- Tribe Ammobatini (*Oreopasites*)
- Tribe Biastini (*Neopasites, Rhopalolemma*)
- Tribe Epeolini (*Epeolus* to *Triepeolus*)
- Tribe Holcopasitini (*Holcopasites*)
- Tribe Neolarrini (*Neolarra*)
- Tribe Nomadini (*Hexepeolus* to *Triopasites*)
- Tribe Townsendiellini (*Townsendiella*)

Subfamily Xylocopinae
- Tribe Ceratinini (*Ceratina*)
- Tribe Xylocopini (*Xylocopa*)

GENERIC STUDIES. Brooks (1988) for Anthophorini; Snelling (1984) for Centridini; Snelling and Brooks (1985) for Ericrocidini; Moure and Michener (1955) for neotropical Eucerini; LaBerge (1957) for Eucerini; Michener and Moure (1957) for Exomalopsini and Tetrapediini; Linsley (1939) for Melectini; Roig-Alsina (1989) for Osirini; Linsley and Michener (1939) and Roig-Alsina (1991) for Nomadinae.

Anthophorinae: Anthophorini

85. ***Anthophora*** Latreille: Small to large, anthophoriform [Figs. 473 and 474], robust, hairy, with or without tergal hair bands and sometimes with white or yellowish tergal integumental bands, whole metasoma sometimes covered with pale hair. Common in western U.S.A., rare elsewhere; about 70 species. Boreal, southward throughout U.S.A., Antilles, and Mexico to Honduras; rare or absent in tropics (cosmopolitan except Australia). Subgenera: *Anthophoroides* Cockerell and Cockerell, *Clisodon* Patton (nests in rotting wood), *Heliophila* Klug, *Lophanthophora* Brooks, *Melea* Sandhouse, *Mystacanthophora* Brooks, *Paramegilla* Friese, and *Pyganthophora* Brooks. See Brooks (1988). The subgenus *Anthophora* s.str. is palearctic. Revi-

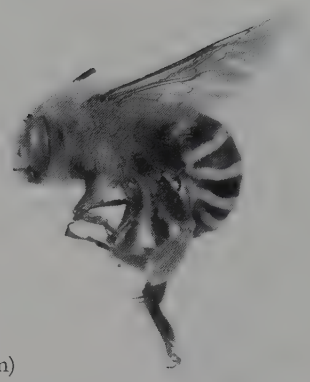
sion: Brooks (1983), subgenus *Melea* as the *bomboides* group. (couplet 118)

Anthophora might be divided into two genera, *Heliophila* Klug (represented in the Western Hemisphere by the forms usually placed in the subgenus *Micranthophora* Cockerell) and *Anthophora* (for the other subgenera listed above). *Heliophila* consists of small to moderate-sized species with the clypeus almost reaching the eye, whereas the others are usually larger, with the clypeus well separated from the eye. In southern Africa, *Heliophila* and *Anthophora* merge; they are therefore regarded as a single genus by Brooks (1988).

86. ***Deltoptila*** LaBerge and Michener: Moderate-sized to large anthophoriform, hairy, resembling *Anthophora* but with unusually protuberant clypeus and long proboscis. Uncommon; 10 species. Moderate to high altitudes, Nuevo León and Durango south to Costa Rica. Revision: LaBerge and Michener (1963). (couplet 119)

87. ***Habropoda*** Smith: Moderate-sized to rather large, anthophoriform, exactly resembling *Anthophora* species in general aspect. Not uncommon in western North America, rare elsewhere; about 22 species. U.S.A. from Rocky Mountain states to Pacific states and Baja California, south in Mexico to Oaxaca; also Illinois to New England south to Texas and Florida. Revision: None. (couplet 119)

American species of this genus have usually been placed in *Emphoropsis* Ashmead; Brooks (1988) has shown that *Emphoropsis* is a synonym of *Habropoda*.



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Figs. 473 and 474. *Anthophora montana* Cresson, male (13 mm) and female (14 mm).

Fig. 475. *Centris* (*Paracentris*) *pallida* Fox, male (13 mm).

Fig. 476. *Centris* (*Paracentris*) *lanosa* Cresson, female (16 mm).

Anthophorinae: Centridini

88. ***Centris*** Fabricius: Moderate-sized to large, anthophoriform [Figs. 475 and 476], hind legs of both sexes with longer and denser hairs than in *Anthophora;* metasoma sometimes red, sometimes weakly metallic bluish or greenish, and sometimes with yellow tergal bands or lateral spots. Common in tropics and southwestern deserts, elsewhere uncommon or rare; about 75 species. Neotropics north through Mexico and as far as central California and Kansas; also present in Antilles and southern Florida. Some species nest in preexisting holes in wood or in old *Sceliphron* nests instead of in the ground; others nest in termite nests. Subgenera: *Acritocentris* Snelling, *Centris* Fa-

bricius s.str., *Exallocentris* Snelling, *Hemisiella* Moure, *Heterocentris* Cockerell, *Melanocentris* Friese, *Paracentris* Cameron, *Ptilocentris* Snelling, *Trachina* Klug, *Xanthemisia* Moure, *Xerocentris* Snelling. Revisions: Snelling (1966c, 1974, 1984). (couplet 107)

The generic name *Hemisia* Klug has been used in place of *Centris*.

89. ***Epicharis*** Klug: Large, euceriform or anthophoriform, hairy, similar in appearance to *Centris;* metasoma sometimes reddish, sometimes with yellow integumental bands. Uncommon; 10 species. Neotropical, ranging through tropical parts of Mexico north to Tamaulipas and Nayarit. Subgenera: *Epicharana* Michener, *Epicharitides* Moure, *Epicharoides* Radoszkowski, *Hoplepicharis* Moure, *Parepicharis* Moure; *Epicharis* s.str. is South American. Revision: Snelling (1984). (couplet 106)

90. ***Ptilotopus*** Klug: Very large, anthophoriform; wing venation like that of *Centris* but whiplike setae arising from preoccipital ridge as in *Epicharis*. Rare; one species, *P. zonatus* (Mocsáry). Tropical South America, north to Panama. Revision: Snelling (1984). (couplet 107)

This genus contains the largest species usually placed in *Centris*. With much hesitation we follow Snelling in regarding it as a genus.

Anthophorinae: Emphorini (synonym: Melitomini)

91. ***Diadasia*** Patton: Small to moderate-sized, anthophoriform [Fig. 477] or euceriform, hairy; metasoma commonly with pale hair bands or general coverage of pale hair; T7 of male with two small apical lobes or points. Common, or rare in tropics; nearly 30 species. Southwestern Canada, western half of U.S.A., Mexico, and on to South America. Subgenera: *Coquillettapis* Viereck, *Dasiapis* Cockerell, *Diadasia* Patton s.str., *Diadasina* Moure (Panama). Revision: Timberlake (1941), species north of Mexico. (couplet 130)

92. ***Melitoma*** Lepeletier and Serville: Moderate-sized, anthophoriform, with distinctive pattern of hairs of different colors on dorsum of thorax and narrow metasomal pale hair bands. Not uncommon; four species. Widespread neotropical, north through Mexico to central and eastern U.S.A., north to North Dakota and New Jersey. Oligolectic on flowers of *Ipomoea*. Revision: None. (couplet 130)

93. ***Ptilothrix*** Smith: Moderate-sized to large, euceriform; like other Emphorini, vertex seen from front is rounded and head is relatively small. Uncommon; three species. Morelos to Arizona; Texas to Florida north to

Fig. 477. *Diadasia rinconis* Cockerell, female.

Kansas and New Jersey; also temperate South America. Revision: None. (couplet 105)

A widely used synonymous generic name is *Emphor* Patton.

Fig. 478. *Ericrocis lata* (Cresson), female (10 mm).

Fig. 479. *Mesoplia azurea* (Lepeletier and Serville), female (13 mm).

Anthophorinae: Ericrocidini (synonym: Ctenioschelini)

94. ***Acanthopus*** Klug: Very large, anthophoriform but without scopa; hind legs extremely long, with conspicuous black fringes on basitarsi. Rare; one species, *A. palmata* (Olivier). South America to Panama. Cleptoparasitic on *Ptilotopus*. See Snelling and Brooks (1985). (couplet 97)

95. ***Aglaomelissa*** Snelling and Brooks: Moderate-sized, anthophoriform but without scopa. Superficially resembles *Mesoplia* but metallic color of metasomal terga integumental rather than due to scalelike hairs; the relation is closer to *Ctenioschelus*. Rare; one species, *A. duckei* (Friese). South America to Costa Rica. Probably cleptoparasite of *Centris*. See Snelling and Brooks (1985). (couplet 100)

96. ***Ctenioschelus*** Romand: Large, anthophoriform but without scopa. Female similar in appearance to *Mesoplia* and *Mesocheira* but metasomal scalelike hairs green; male remarkable for extremely long antennae, suggesting those of a cerambycid beetle; arolia present, unlike other genera of this tribe. Rare; one species, *C. goryi* (Romand). Neotropics north through tropical Mexico to Jalisco. Cleptoparasitic, probably on *Centris*. See Snelling and Brooks (1985). (couplet 100)

97. ***Ericrocis*** Cresson: Middle-sized or rather large, anthophoriform [Fig. 478] but without scopa, black with conspicuous white to tawny spots and bands of short, dense pubescence. Uncommon to locally common; two species. Southern California deserts to Texas, also Florida, south through Mexican desert and plateau to Oaxaca. Cleptoparasite of *Centris*. Revision: Snelling and Zavortink (1984). (couplet 96)

98. ***Mesocheira*** Lepeletier and Serville: Moderate-sized, anthophoriform, without scopa; metasoma metallic because of blue or greenish metallic scales. Uncommon; one species, *M. bicolor* (Fabricius). Neotropical region north to Guerrero and Veracruz; also Antilles. Cleptoparasitic, probably on *Centris*. See Snelling and Brooks (1985). (couplet 99)

99. ***Mesoplia*** Lepeletier: Rather large, anthophoriform [Fig. 479] but without scopa, resembling *Ctenioschelus* and *Mesocheira;* metasomal scalelike hairs blue or blue-green. Rare or locally common; about six species. Neotropics, north through tropical Mexico to Tamaulipas and southern Arizona; also Antilles. Cleptoparasites of *Centris* and *Epicharis*. Subgenera: *Eumelissa* Snelling and Brooks, *Mesoplia* Lepeletier s.str. See Snelling and Brooks (1985). (couplet 98)

Anthophorinae: Eucerini

100. ***Agapanthinus*** LaBerge: Moderate-sized, euceriform, with pale tergal hair bands; aspect of *Melissodes*. Rare; one species, *A. callophila* (Cockerell). Baja California and California deserts. See LaBerge (1957). (couplets 148♀ and 163♂)

101. ***Anthedonia*** Michener: Rather large, euceriform, hairy, with tergal hair bands; appearance that of *Svastra* or large *Melissodes*. Rare; two species. New Jersey to Utah south to Georgia and Durango. Oligolectic on *Oenothera*. Revision: LaBerge (1955). (couplets 141♀ and 166♂)

This genus is basically a *Svastra* adapted to an unusual

pollen source; it should probably be regarded as a subgenus of *Svastra*.

102. ***Cemolobus*** Robertson: Moderate-sized, anthophoriform or euceriform, hairy, with inconspicuous metasomal hair bands, easily distinguished from all other bees by strongly trilobed clypeal margin. Rare; one species, *C. ipomoeae* (Robertson). Central and eastern U.S.A. Oligolectic on flowers of *Ipomoea*. (couplets 134♀ and 154♂)

103. ***Florilegus*** Robertson: Moderate-sized, euceriform, commonly with tergal hair bands; aspect of *Melissodes* but tergal surface usually feebly bluish or greenish. Uncommon; about five species. Widespread in neotropics, ranging in humid and mesic areas through Antilles and Mesoamerica to central and eastern U.S.A., north to Colorado, Nebraska, and New Jersey. Subgenera: *Florilegus* Robertson s.str., *Floriraptor* Moure and Michener. Revision: Urban (1970). (couplets 152♀ and 157♂)

104. ***Gaesischia*** Michener, LaBerge and Moure: Smallish or moderate-sized, euceriform [Fig. 480], with weak tergal hair bands. Uncommon; two species. Neotropical, mostly in dry areas, through Mexico to southern Arizona. Subgenera: *Gaesischiana* Michener, LaBerge and Moure, *Prodasyhalonia* LaBerge. Revisions: Urban (1968a); LaBerge (1958a). (couplets 145♀, 146♀, and 164♂)

The subgenus *Gaesischia* s.str. may be strictly South American, but Urban (1968a) considers *Prodasyhalonia* a synonym of *Gaesischia* s.str., which would therefore reach Mexico. The male of *Prodasyhalonia* is unknown and may not run to *Gaesischia* in "Key to the Genera."

105. ***Idiomelissodes*** LaBerge: Moderate-sized, euceriform, with pale tergal hair bands; aspect of *Melissodes*. Rare; one species, *I. duplocincta* (Cockerell). New Mexico, Arizona, and Coahuila to Baja California. Revision (as part of *Melissodes*): LaBerge (1956a). (couplets 150♀ and 167♂)

Idiomelissodes may well be a subgenus of *Melissodes* or *Svastra*.

106. ***Loxoptilus*** LaBerge: Moderate-sized, euceriform, with tergal hair bands and strongly protuberant clypeus. Uncommon; two species. Moderate altitudes in Mexico,

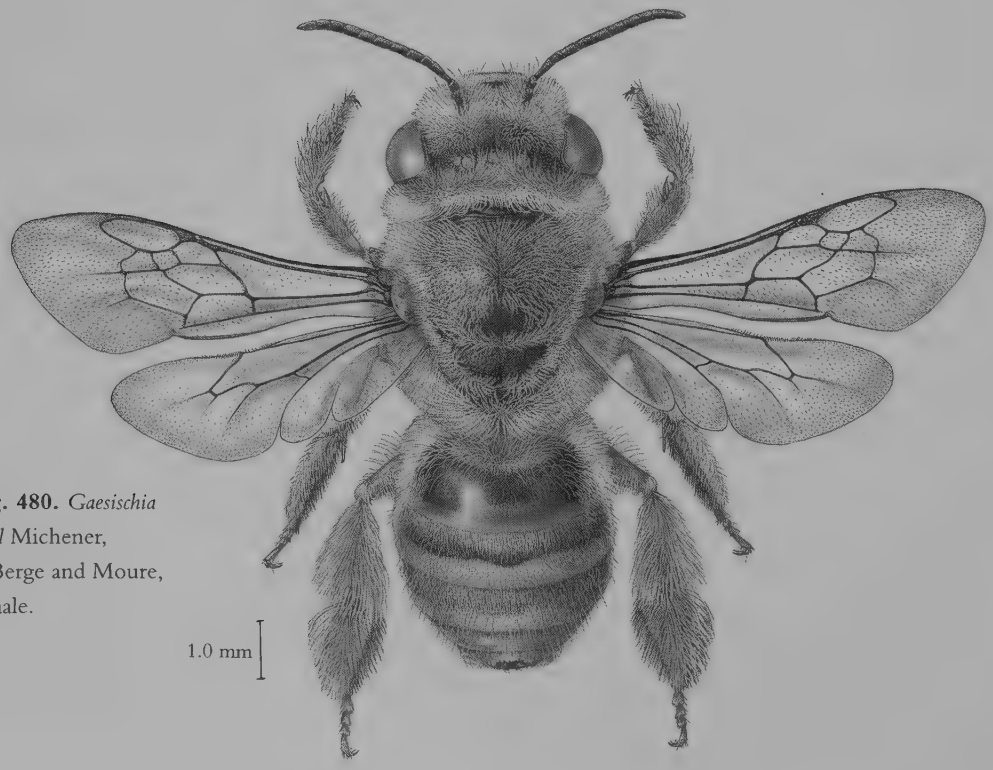


Fig. 480. *Gaesischia exul* Michener, LaBerge and Moure, female.

Nayarit to Morelos and Guerrero. Revision: LaBerge (1957). (couplets 142♀ and 169♂)

This genus is related to *Tetraloniella,* the protuberant clypeus and associated characters being the principal differentiating features. It might best be regarded as a part of *Tetraloniella.*

107. ***Martinapis*** Cockerell: Moderate-sized euceriform or anthophoriform, males with yellow antennae. Rare; two species. Kansas and Texas to California, south to Durango. Our species both belong to the subgenus *Martinapis* s.str. Revision: Zavortink and LaBerge (1976). (couplets 138♀ and 162♂)

108. ***Melissodes*** Latreille: Moderate-sized to smallish, euceriform [Figs. 481 and 482], with or less commonly without bands of pale hair on terga. Common, rare in tropics; 119 U.S. species, a few more in Antilles and Mesoamerica. Southern Canada to Mexico, Antilles, and South America, the most common eucerine genus in most of North America. Some species make communal nests, several individuals using one burrow. Subgenera: *Apomelissodes* LaBerge, *Callimelissodes* LaBerge, *Ecplectica* Holmberg, *Eumelissodes* LaBerge, *Heliomelissodes* LaBerge, *Melissodes* Latreille s.str., *Psilomelissodes* LaBerge, *Tachymelissodes* LaBerge. Revision: LaBerge (1956a,b, 1961); *Svastra* was included in *Melissodes* in that revision. (couplets 138♀ and 158♂)

The anteriorly narrowed tegulae (couplets 137♀ and 158♂) is a subtle character and may require removal of hair to see.

109. ***Melissoptila*** Holmberg: Smallish, euceriform, metasomal terga commonly covered with short tawny hairs or at least with broad apical zones of such hairs; aspect suggestive of small *Melissodes.* Moderately common, rare in Antilles and Texas; few species. Neotropical, ranging north in tropical and subtropical areas to Antilles and through Mexico to southernmost Texas. Our species are in the subgenus *Ptilomelissa* Moure; *Melissoptila* s.str. is restricted to southern South America. Revision: Urban (1968b). (couplets 149♀ and 156♂)

110. ***Pectinapis*** LaBerge: Moderate-sized, euceriform, with tergal hair bands. Rare; three species. Moderate altitudes in Mexico—Puebla and Morelos to Nuevo León and Jalisco. Revisions: LaBerge (1970, 1989a). (couplets 140♀ and 172♂)

Figs. 481 and 482. *Melissodes bimaculata* (Lepeletier), male (12 mm) and female (8 mm).

Pectinapis is closely related to *Tetraloniella* and perhaps should be regarded as part of that genus.

111. ***Peponapis*** Robertson: Moderate-sized, robust euceriform, commonly with fulvous or brown hair, tergal bands of hair weak or absent; antennae of male shorter than in most Eucerini. Common; 11 species. U.S.A. and Mesoamerica; extends to South America. Oligolectic on *Cucurbita.* Revisions: Hurd and Linsley (1964, U.S. species; 1966, Mexican species; 1970). (couplets 136♀, 158♂, and 171♂)

The males come out twice in "Key to the Genera" because, although most lack teeth on T7, some possess such teeth. The six proposed subgenera for 13 species seem unnecessary. South American forms are perhaps more different and may justify subgeneric status, but all our species can well remain in *Peponapis* s.str. See Hurd and Linsley (1970).

112. ***Simanthedon*** Zavortink: Moderate-sized, euceriform [Fig. 483], without pale hair bands on metasomal terga. Snoutlike clypeal profile of male is particularly distinctive. Rare; one species, *S. linsleyi* Zavortink. Texas to Arizona deserts south to Durango. See Zavortink (1975). (couplets 144♀ and 160♂)

Fig. 483. *Simanthedon linsleyi* Zavortink, female (14 mm).

113. ***Svastra*** Holmberg: Large to moderate-sized, euceriform, commonly with tergal hair bands or terga suffused with pale hair; aspect is that of large *Melissodes*. Common; 15 species. Throughout southernmost Canada, U.S.A., and Mexico south to Oaxaca, rare in tropics. Some species have communal nests, several individuals using one burrow. Subgenera: *Brachymelissodes* LaBerge, *Epimelissodes* Ashmead; *Svastra* s.str. is South American. Revisions (as part of *Melissodes*): LaBerge (1956a, 1958b). (couplets 151♀ and 168♂)

114. ***Synhalonia*** Patton: Moderate-sized to large, euceriform, often with weak but rather broad pale tergal hair bands and strongly protuberant clypeus; male antennae long and black, usually not brown beneath as in most other temperate climate Eucerini. Spring bees except in Mexico; most other temperate Eucerini are summer or autumnal forms. Moderately common; 53 North American species. Southern Canada, U.S.A., south to Oaxaca (holarctic). Revision: Timberlake (1969a). (couplets 144♀ and 172♂)

The name *Tetralonia* Spinola has often been used for this genus.

115. ***Syntrichalonia*** LaBerge: Large, euceriform, metasoma largely covered with testaceous hair forming weak tergal bands. Uncommon; one species, *S. exquisita* (Cresson). Oaxaca to southern Arizona and Texas. See LaBerge (1957). (couplets 147♀ and 166♂)

116. ***Tetraloniella*** Ashmead: Moderate-sized or smallish, euceriform, aspect of *Melissodes,* terga commonly with pale bands of hair or covered with pale hair. Rather uncommon; 19 species in U.S.A., perhaps as many more in Mexico. Western and central U.S.A., Baja California, south to Jalisco, Tamaulipas, and probably Morelos (holarctic). Revision: None. (couplets 145♀, 152♀, 164♂, and 170♂)

This genus is often called *Xenoglossodes* Ashmead in North America, although its similarity to the palearctic *Tetraloniella* has long been known. Recent incomplete studies suggest that the synonymy of *Xenoglossodes* and *Tetraloniella* is uncertain. Females come out twice in "Key to the Genera" because the scopal hairs vary from simple to plumose; males come out twice because of variation in the size of the middle tibial spur.

117. ***Thygater*** Holmberg: Moderate-sized to rather large, euceriform, hairy, with strongly protuberant clypeus, very long black antennae in males, and without metasomal hair bands. Uncommon to common; eight species. Neotropical (including mountains), north in Mexico to Sinaloa, Zacatecas, and San Luis Potosí. Subgenera: *Nectarodiaeta* Holmberg and *Thygater* Holmberg s.str. Revision: Urban (1967). (couplets 133♀ and 153♂)

118. ***Xenoglossa*** Smith: Moderate-sized to large, euceriform, commonly with fulvous hair and sometimes with body red, tergal hair bands weak or absent; antennae of male much shorter than in most Eucerini. Uncommon; seven species. Southern U.S.A. (North Carolina to California), south to Costa Rica. Oligolectic on flowers of *Cucurbita*. Subgenera: *Eoxenoglossa* Hurd and Linsley, *Xenoglossa* Smith s.str. Revisions: Hurd and Linsley (1964, U.S. species; 1967; 1970). (couplets 135♀ and 159♂)

Anthophorinae: Exomalopsini

119. ***Ancyloscelis*** Latreille: Small, robust (especially in females), anthophoriform [Fig. 484], moderately hairy with metasomal hair bands. Males easily recognized by enormous hind legs; females resemble *Exomalopsis* superficially. Uncommon, rare in U.S.A.; two species in U.S.A., a few others in Mesoamerica. Widespread in neotropics, north through Mexico to Arizona, Colorado, and Texas. Oligolectic on *Ipomoea*. Revision: Michener (1942, U.S. species). (couplet 131)

120. ***Exomalopsis*** Spinola: Minute to moderate-sized, anthophoriform [Figs. 485 and 486], hairy, occasionally with red metasoma. Common in tropics north to southwestern U.S.A., moist tropics to desert, uncommon elsewhere; 98 species. Neotropics, including Antilles, north

to central and western U.S.A. (as far north as Utah, Nebraska), southern states east to Florida. Nests are communal, several bees using one burrow. Subgenera: *Anthophorisca* Michener and Moure, *Anthophorula* Cockerell, *Exomalopsis* Spinola s.str., *Megomalopsis* Michener and Moure, *Panomalopsis* Timberlake, *Phanomalopsis* Michener and Moure. Revisions: Timberlake (1947, U.S.A. only; 1980a). Michener and Moure (1957) provided a key to the subgenera. (couplets 127 and 199)

Most species have three submarginal cells, but some species of the subgenus *Anthophorula* have two; hence the genus appears twice in "Key to the Genera."

121. ***Monoeca*** Lepeletier and Serville: Moderate-sized, anthophoriform, like a large *Exomalopsis* without metasomal hair bands; head and thorax hairy; metasoma sometimes red. Rare; perhaps only two species in our area. Tropical America, north in tropical Mexico to Jalisco. Revision: None. (couplet 128)

The synonymous name *Fiorentinia* Dalla Torre has sometimes been used for this genus.

122. ***Paratetrapedia*** Moure: Small to moderate-sized, somewhat shiny, nonhairy, trigoniform [Fig. 487]. Strikingly mimetic of various species of *Trigona*—black, largely or wholly yellow or testaceous, black with red metasoma, and so forth; face of male with yellow or white areas. Moderately common; several species. Widespread in neotropics, extending into tropical Mexico at least to San Luis Potosí and Jalisco; also Jamaica. Nests of *Xanthopedia* in earth banks, of other subgenera probably in preformed holes in wood. Subgenera: *Lophopedia* Michener and Moure, *Paratetrapedia* Moure s.str., and *Xanthopedia* Michener and Moure, the last known only north to Costa Rica and Jamaica. Revision: None. (couplets 114 and 128)

Variation and intermediacy in the shape of the posterior thoracic profile (couplet 108) leads to the appearance of *Paratetrapedia* twice in "Key to the Genera."

Fig. 484. *Ancyloscelis* sp., male (7 mm).

Fig. 485. *Exomalopsis similis* Cresson, male (6 mm).

Fig. 486. *Exomalopsis solani* Cockerell, female (8 mm).

Fig. 487. *Paratetrapedia lugubris* (Cresson), female (10 mm).

Anthophorinae: Melectini

123. ***Brachymelecta*** Linsley: Small, anthophoriform but without scopa. Very rare; one species, *B. mucida* (Cresson), known from a single specimen from "Nevada" collected before 1879 (Linsley 1939). (couplet 197)

Fig. 488. *Xeromelecta californica* (Cresson), female (10 mm).

124. ***Melecta*** Latreille: Rather large, hairy anthophori-

form, without scopa; head, thorax, and base of metasoma hairy, metasoma with or without limited patches of short white hair. Uncommon in western U.S.A., elsewhere rare; five species. Southwestern Canada, U.S.A. except northeast, Baja California, perhaps other parts of northern Mexico (holarctic). Cleptoparasites of *Anthophora* and *Habropoda*. Subgenera: *Melecta* Latreille s.str., *Melectomimus* Linsley. Revisions: Linsley (1939); Hurd and Linsley (1951), California species (all American species occur in that state). (couplet 116)

125. ***Xeromelecta*** Linsley: Moderate-sized to rather large, euceriform [Fig. 488] but without scopa, with somewhat hairy head and thorax and usually with patches or broken bands of short white hair on metasoma. Common in western U.S.A., rare elsewhere; five species. Southwestern Canada, western and central U.S.A., to central Mexico (Puebla); also Greater Antilles. Cleptoparasites of *Anthophora*. Subgenera: *Melectomorpha* Linsley, *Nesomelecta* Michener (Antilles), *Xeromelecta* Linsley s.str. Revisions: Linsley (1939); Hurd and Linsley (1951), California species; Michener (1988), Antillean species. (couplet 116)

126. ***Zacosmia*** Ashmead: Small, anthophoriform but without scopa, metasoma partly to wholly variegated with pale gray or brown because of short, appressed hair. Uncommon; one species, *Z. maculata* (Cresson). Southern Alberta, U.S.A. from Rocky Mountains to Pacific coast, Texas, Chihuahua (unsubstantiated record for Durango). Cleptoparasite of *Anthophora,* subgenus *Heliophila*. See Hurd and Linsley (1951). (couplet 104)

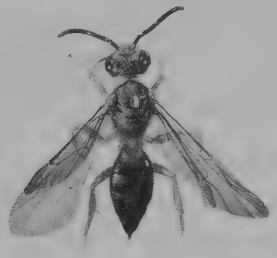


Fig. 489. *Osiris* sp., female (10 mm) (provided by D. W. Roubik).

Fig. 490. *Rhathymus* sp., female (20 mm) (from Roubik 1989).

Anthophorinae: Osirini

This tribe has usually been placed in the Nomadinae, but Roig-Alsina (1989) shows it is not a member of that group. It is provisionally included in the Anthophorinae.

127. ***Epeoloides*** Giraud: Rather small, dark, nonhairy, epeoliform; body all black. Extremely rare; probably only one species, *E. pilosula* (Cresson). Northeastern and central U.S.A. and southeastern Canada (holarctic). Cleptoparasite of *Macropis*. (couplet 115)

This genus has not been collected in North America for many years. In the past it has usually been put in its own tribe, the Epeoloidini, in the Nomadinae.

128. ***Osiris*** Smith: Moderate-sized, smooth and shiny, nomadiform [Fig. 489], superficially almost hairless, yellowish brown or rarely blackish. Rare; about 15 species. Widespread in American tropics, north to San Luis Potosí and Nayarit. Cleptoparasitic, host unknown. Revisions: Shanks (1986; 1987, Mexican species). (couplet 29)

129. ***Protosiris*** Roig-Alsina: Superficially like *Osiris;* see characters in "Key to the Genera." Rare; two species. American tropics north to Puebla (undescribed species). Cleptoparasitic, host unknown. Revisions: Included in Shanks (1986); see Roig-Alsina (1989). (couplet 29)

Anthophorinae: Protepeolini

130. ***Leiopodus*** Smith: Moderate-sized epeoliform [Fig. 491], not hairy but with striking pattern of areas of short pale pubescence. Rare; one species. Texas to California south to Guatemala, in xeric regions (other species, Venezuela to Argentina). Cleptoparasites of *Diadasia*. Revision: Eickwort and Linsley (1978). (couplet 125)

In North America this genus has been called *Protepeolus* Linsley and Michener, but it is the same as the South American *Leiopodus*. The tribal name Protepeolini still stands.

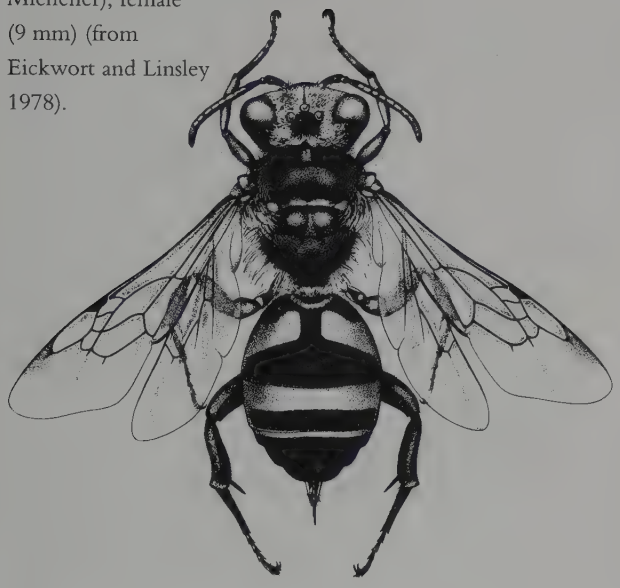


Fig. 491. *Leiopodus singularis* (Linsley and Michener), female (9 mm) (from Eickwort and Linsley 1978).

Fig. 492. *Neopasites fulviventris* (Cresson), female (8 mm) (from Linsley 1943b).

Anthophorinae: Rhathymini

131. ***Rhathymus*** Lepeletier and Serville: Large, elongate epeoliform or nomadiform [Fig. 490], Mexican species with areas of short pale hair; wholly black or with red metasoma, or body mostly yellow. Rare; three species. Neotropical, ranging into tropical Mexico as far as San Luis Potosí. Cleptoparasites of *Epicharis*. Revision: None. (couplet 115)

Anthophorinae: Tetrapediini

132. ***Coelioxoides*** Cresson: Moderate-sized, head and thorax very coarsely pitted, metasoma tapering to point suggestive of *Coelioxys,* terga with narrow hair bands. Rare; one species, *C. punctipennis* Cresson. Widespread in American tropics, north into tropical Mexico as far as San Luis Potosí. Cleptoparasitic, host unknown. Revision: Roig-Alsina (1990). (couplet 101)

This genus has usually been assumed to be in the subfamily Nomadinae, but Roig-Alsina (1989) considers it as a cleptoparasitic member of the tribe Tetrapediini in the Anthophorinae.

133. ***Tetrapedia*** Klug: Rather small, shining, trigoniform, resembling a rather elongate, unusually hairy (in ours) black *Trigona;* appearance similar to that of black *Paratetrapedia* but more hairy, face of male black. Moderately common; few species. Widespread in tropical America, north to Tamaulipas and Jalisco. Nests in preformed burrows in wood. Subgenera: Ours are *Tetrapedia* s.str. Revision: None. (couplet 103)

Nomadinae: Ammobatini

134. ***Oreopasites*** Cockerell: Minute to small, epeoliform, usually with red metasoma and without well-defined areas of short, pale hair. Rare; five species. Colorado to California, south to Chihuahua. Cleptoparasites of *Calliopsis* (subgenera *Hypomacrotera, Macronomadopsis, Micronomadopsis, Nomadopsis*) and *Perdita*. Revisions: Linsley (1941); Rozen (1992). (couplet 199)

Nomadinae: Biastini

135. ***Neopasites*** Ashmead: Minute to small, epeoliform [Fig. 492], sometimes with red metasoma, and without defined patches of short, pale hairs. Rare; five species. California, Arizona, and Baja California Norte. Cleptoparasites of *Dufourea*. Subgenera: *Micropasites* Linsley, *Neopasites* Ashmead s.str. Revision: Linsley (1943a), as *Gnathopasites*. (couplet 201)

The name *Gnathopasites* Linsley and Michener was formerly applied to this genus; see Linsley and Michener (1937). *Neopasites* could well be regarded as a subgenus of *Biastes* of the palearctic region.

136. ***Rhopalolemma*** Roig-Alsina: Moderate-sized, epeoliform, metasoma red with strong bands of short, pale pubescence; apices of third valvulae (sting sheaths) swollen. Rare; one species, *R. robertsi* Roig-Alsina. Southern California, Arizona. A probable cleptoparasite of *Protodufourea*. (couplet 202)

Nomadinae: Epeolini

137. ***Epeolus*** Latreille: Small to moderate-sized, epeoliform, patterned like *Triepeolus*. Moderately common; 52 species in U.S.A. and Canada, others in Mexico. Southern Canada through U.S.A., Antilles, Mesoamerica, and South Amercia (holarctic, neotropical, and African). Cleptoparasites of *Colletes*. Subgenera: *Epeolus* Latreille s.str., *Trophocleptria* Holmberg. Revision: None. (couplet 112)

Most species have three submarginal cells and run directly to couplet 112, but a few have only two and run to couplet 112 via couplet 181.

Epeolus is divisible into two subgenera that have long had generic status. A. Roig-Alsina (pers. comm. 1991), however, has shown their great similarity and considers them only subgenerically distinct. They differ as follows:

a. Venter of mesothorax with anterior vertical part set off from horizontal part by a transverse carina, often irregular or broken medially and rarely weak; lateral angle of pronotum rounded but well developed, its anteroposterior length about equal to diameter of pronotal lobe (if only moderately developed, then transverse ventral mesothoracic carina strong); scutellum coarsely punctate or reticulate, often produced to two posteriorly directed teeth ..... *Trophocleptria*

— Venter of mesothorax with anterior vertical part rounding onto horizontal part with no intervening transverse carina; lateral angle of pronotum weakly developed, anteroposterior length much less than diameter of pronotal lobe; scutellum punctured, biconvex ... . *Epeolus* s.str.

Trophocleptria is used here in a broader sense than in the past to include *E. bifasciatus* Cresson, as well as similar forms incorrectly placed in a subgenus *Pyrrhomelecta* Ash-

Fig. 493. *Triepeolus concavus* (Cresson), female.

mead of *Epeolus* by Michener (1954a). In general, *Trophocleptria* has a longer stigma and larger marginal cell than *Epeolus,* but these characters are not reliable. The most easily seen and reliable distinguishing character of *Trophocleptria* is the rather thick, anteriorly produced, truncate "collar" of the pronotum, resulting in the strong lateral angle of the pronotum as described above.

138. ***Odyneropsis*** Schrottky: Moderate-sized to rather large, slender epeoliform or nomadiform, nonhairy, wasplike, largely black or brown. Rare; two species. Widespread in neotropics, ranging north through Mexico to southern Arizona. Cleptoparasites of *Ptiloglossa.* Revision: None. (couplet 111)

The moderate-sized species, known north only to Panama, have been placed in the genus *Parammobates* Friese, but this group does not seem to differ at the generic level from the larger, typical *Odyneropsis.*

139. ***Thalestria*** Smith: Rather large, epeoliform, brilliantly metallic blue-green because of colored scalelike hairs; scutellar as well as axillar spines sharp; S6 of female much as in *Triepeolus;* pseudopygidial area of S5 small, dark, about three times as wide as long. Rare; one species, *T. smaragdina* Smith. South America; Costa Rica. Cleptoparasites of *Oxaea.* (couplet 110)

140. ***Triepeolus*** Robertson: Moderate-sized to large, epeoliform [Fig. 493], with striking pattern of bands and spots produced by areas of short pale pubescence; males almost indistinguishable from those of *Epeolus.* Common in nearctic region, rare in tropics; more than 100 species. Southern Canada, U.S.A., Antilles, and Mexico, south to Central and South America (few species also in palearctic region). Cleptoparasite of eucerine bees and *Dieunomia, Protoxaea,* and *Ptiloglossa.* Revision: None. (couplet 112)

The great majority of species have three submarginal cells and run directly to couplet 112, but a few have two submarginal cells and run to couplet 112 via couplet 181.

Fig. 494. *Holcopasites arizonicus* (Linsley), male (6 mm) (from Linsley 1943c).

Fig. 495. *Holcopasites bigibbosus* Hurd and Linsley, female (7 mm) (from Hurd and Linsley 1972).

Nomadinae: Holcopasitini

141. ***Holcopasites*** Ashmead: Minute to small, coarsely sculptured, epeoliform [Figs. 494 and 495]; metasoma usually red, terga with small spots or bands of short white pubescence. Uncommon; 15 species. Southern Canada, U.S.A. except Pacific Coast, northern Mexico, Mexican plateau south to Puebla. Cleptoparasites of *Calliopsis* (subgenera *Calliopsima, Calliopsis* s.str., *Hypomacrotera,* and *Verbenapis*), *Heterosarus* (both subgenera), *Metapsaenythia,* and *Pseudopanurgus.* Subgenera: *Holcopasites* Ashmead s.str., *Trichopasites* Linsley. Revisions: Linsley (1943b); Hurd and Linsley (1972). (couplet 179)

In some of the older literature this genus is called *Neopasites* Ashmead. *Holcopasites* has been regarded as a subgenus of *Schmiedeknechtia* Friese of the palearctic region, but see Cooper (1993) for opposing viewpoint.

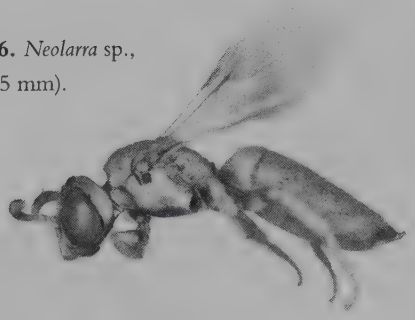


Fig. 496. *Neolarra* sp., female (5 mm).

Nomadinae: Neolarrini

142. ***Neolarra*** Ashmead: Minute to small, epeoliform [Fig. 496], often largely covered with short, pale hair; marginal cell very short, truncate, even more reduced than in *Perdita*. Uncommon; 14 species. Southernmost Canada (Alberta), western half of U.S.A., Chihuahua and no doubt other northern Mexican states; east to Georgia. Cleptoparasitic on *Perdita*. Subgenera: *Neolarra* Ashmead s.str., *Phileremulus* Cockerell. Revisions: Michener (1939b); Shanks (1978). (couplet 174)

Nomadinae: Nomadini

143. ***Hexepeolus*** Linsley and Michener: Moderate-sized, epeoliform [Fig. 497], with apical tergal hair bands on sometimes red metasoma. Rare; one species. Deserts of southern California, Arizona, and Sonora. Cleptoparasite, perhaps of *Ancylandrena*. Revisions: Linsley and Michener (1937); Shanks Gingras (1983). (couplets 32 and 191)

This genus appears twice in "Key to the Genera" because of intraspecific variation in the number of submarginal cells; nearly all specimens have three. It is included in the Nomadini because of tradition; it is a very isolated and highly plesiomorphic genus, as indicated by A. Roig-Alsina (pers. comm. 1991).

144. ***Melanomada*** Cockerell: Small, nomadiform, black, commonly with red metasoma, superficially resembling some of the smallest species of *Nomada*. Rare; six species. Great Plains (Montana to Texas) to southern California south to Morelos. Cleptoparasite of *Exomalopsis*. Revision: Snelling and Rozen (1987). (couplets 33 and 192)

Hesperonomada Linsley is a synonym of *Melanomada*,

Fig. 497. *Hexepeolus rhodogyne* Linsley and Michener, female.

differing in having two instead of three submarginal cells. *Melanomada* therefore appears twice in "Key to the Genera."

145. ***Nomada*** Scopoli: Small (almost minute) to moderate-sized, wasplike, slender nomadiform [Figs. 498 and 499], without conspicuous pubescence; black or red, commonly with yellow or white markings, sometimes largely black with metasoma red or largely yellow. Common in temperate regions, rare in tropics; 287 species in U.S.A. and Canada, 21 additional species in Mesoamerica. Boreal regions of Canada throughout U.S.A., Mexico, Antilles, and on to South America (cosmopolitan, scarce in sub-Saharan Africa and Australia). Cleptoparasites of *Agapostemon, Andrena, Halictus, Nomia, Exomalopsis, Synhalonia,* and, in the palearctic region, *Lasioglossum, Melitta,* and *Panurgus;* most temperate climate species attack *Andrena.* Subgenera: (1) *Aphelonomada* Snelling (Cuba), *Hypochrotaenia* Holmberg, *Micronomada* Cockerell and Atkins; (2) *Centrias* Robertson; (3) *Asteronomada* Broemeling, *Holonomada* Robertson, *Laminomada* Rodeck, *Nomada* Scopoli s.str. (includes *Gnathias* Robertson), *Nomadita* Mocsáry, *Pachynomada* Rodeck, *Phelonomada* Snelling. Revisions: Evans (1972), subgenus *Holonomada;* Rodeck (1949), subgenus *Nomadita,* under the name *Callinomada* Rodeck; Swenk (1912), species of Nebraska; Broemeling (1988), subgenus *Nomadita;* Broemeling and Moalif (1988), subgenus *Pachynomada.* Most subgenera have never been revised. (couplets 33, 178, and 192)

Snelling (1986a) has divided the subgenera into the three groups indicated above and has given each group generic status; that is, he recognizes the genera *Hypochrotaenia, Centrias,* and *Nomada.* These are perhaps valid groups, but the differences between them are not very impressive and sometimes break down. For the present we have chosen to leave all the subgenera in the easily recognized genus *Nomada.* Because of variation in the number and relative sizes of the submarginal cells, *Nomada* comes out three times in "Key to the Genera"; most species run to couplet 33.

146. ***Paranomada*** Linsley and Michener: Moderate-sized, smooth and shiny, black or red, nomadiform [Fig. 500], with some areas of dense pubescence, unlike *Osiris.* Thorax dorsoventrally flattened, unlike any other bee. Rare; two or three species. Deserts of southwestern U.S.A. and northern Mexico. Cleptoparasites of *Exomalopsis.* Revisions: Linsley (1943c, 1945). (couplet 30)

Fig. 498. *Nomada civilis* Cresson, male (9 mm).

Fig. 499. *Nomada luteola* Olivier, female (12 mm).

147. ***Triopasites*** Linsley: Small, nomadiform or epeoliform [Fig. 501], usually with metasoma red. Rare; five species. Texas to California, Baja California. Cleptoparasitic on *Exomalopsis.* Revision: Linsley (1943c). (couplet 32)

Possibly not generically distinct from *Melanomada.*

Nomadinae: Townsendiellini

148. ***Townsendiella*** Crawford: Minute to small, epeoliform [Fig. 502], metasoma sometimes red, commonly with bands or areas of short, white pubescence. Rare; three species. Southwestern U.S.A. and Baja California, in xeric areas. Cleptoparasites of *Hesperapis* and probably of *Conanthalictus.* Subgenera: *Eremopasites* Linsley, *Townsendiella* Crawford s.str., *Xeropasites* Linsley. Revision: Linsley (1943c). (couplets 179 and 202)

Because of variation in the relative lengths of the submarginal cells and in the position of the first recurrent vein (couplet 175), *Townsendiella* appears twice in "Key to the Genera."

Fig. 500. *Paranomada velutina* Linsley, female (8 mm) (from Linsley 1943a).

Fig. 501. *Triopasites micheneri* Linsley, female (5 mm) (from Linsley 1943a).

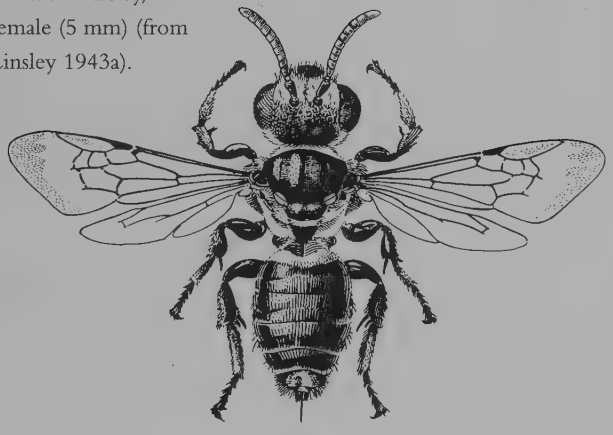


Fig. 502. *Townsendiella californica* Michener, female (5 mm) (from Linsley 1943a).

Xylocopinae: Ceratinini

149. ***Ceratina*** Latreille: Minute to moderate-sized, sparsely haired, shiny, slender hylaeiform [Figs. 503 and 504] or nomadiform but with tibial scopa; black to weakly blue or green or in tropics varying to brilliant green, some with metasoma coppery or red. Such size and coloration suggests augochlorine halictids, from which *Ceratina* differs as follows: glossa and labial palpi long, basal vein only gently curved, clypeus shaped like thick inverted T and commonly with a yellow or white mark in female and extensively pale in male; femoral scopa absent. Common; 21 species north of Mexico, many more in Mesoamerica. Neotropics including Antilles, north throughout Mexico and U.S.A. (rare in deserts) to southern Canada (cosmopolitan). Nests in burrows, usually made by the bees, in pith of dead stems. Subgenera: *Calloceratina* Cockerell, *Ceratina* Latreille s.str. (our species in a group called *Ceratinula* Moure), *Crewella* Cockerell, *Euceratina* Hirashima (introduced from the palearctic region to California), *Zadontomerus* Ashmead. Revision: Daly (1973), species north of Mexico. (couplets 34 and 120)

Because of variation and especially intermediacy in the apex of the marginal cell (couplet 26), *Ceratina* appears twice in "Key to the Genera."

Xylocopinae: Xylocopini

150. ***Xylocopa*** Latreille: Large to very large, anthophoriform or bombiform [Fig. 505], black to metallic blue or green, males of some species yellow or testaceous. Wing venation (long, slender marginal cell, second submarginal cell greatly narrowed costad) distinguishes this genus from all others. Common or moderately common in tropics; 32 species. Tropical America, north throughout Antilles, Mexico, and U.S.A. to southern Canada (cosmopolitan). Nests in burrows, usually made by the bees, in wood or stems. Subgenera: *Calloxylocopa* Hurd and Moure, *Megaxylocopa* Hurd and Moure (= *Neoxylocopa*?), *Neoxylocopa* Michener, *Notoxylocopa* Hurd, *Schoenherria* Lepeletier, *Stenoxylocopa* Hurd and Moure, *Xylocopoides* Michener. Keys to subgenera: Hurd (1956); Hurd and Moure (1963). Revisions: Hurd (1955, species north of Mexico; 1961, *Xylocopoides;* 1978b, *Stenoxylocopa*); O'Brien and Hurd

(1965, *Notoxylocopa*). See list of species, Hurd (1978a). (couplet 93)

Family Apidae

Proboscis as described for Megachilidae (flabellum rarely absent, last two segments of labial palpus rarely absent). Facial fovea absent. Labrum broader than long. Three submarginal cells in forewing or wing venation much reduced and marginal cell weak or open at apex. Scopa, except when absent, consisting of marginal hairs on hind tibia surrounding bare area on outer surface and forming a corbicula. Pygidial plate absent.

503

504

Figs. 503 and 504. *Ceratina* (*Zadontomerus*) *timberlakei* Daly, male (7 mm) and female (8 mm) (from Daly 1973).

CLASSIFICATION

Subfamily Apinae (*Apis*)
Subfamily Bombinae (*Bombus, Psithyrus*)
Subfamily Euglossinae (*Aglae* to *Exaerete*)
Subfamily Meliponinae (*Cephalotrigona* to *Trigonisca*)

GENERIC STUDIES. For Meliponinae, Schwarz (1948, 1949), Michener (1990); for Euglossinae, Moure (1963), Kimsey (1982), and Michener (1990). All the genera of Meliponinae except *Melipona* and *Lestrimelitta* have often been lumped under the name *Trigona*. They are quite distinct, however, and we believe that generic status is justified for them.

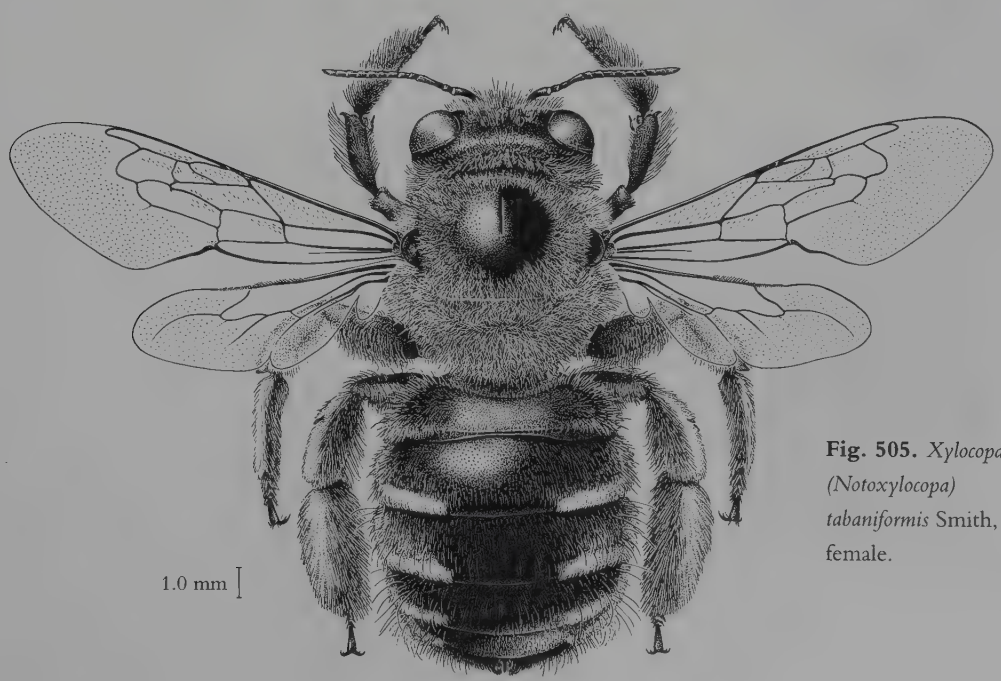
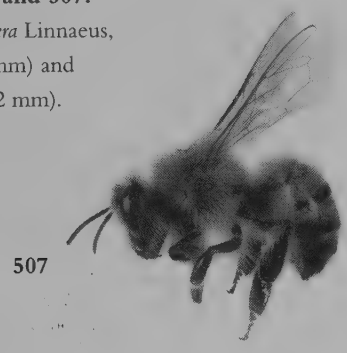


Fig. 505. *Xylocopa (Notoxylocopa) tabaniformis* Smith, female.



Figs. 506 and 507. *Apis mellifera* Linnaeus, male (16 mm) and worker (12 mm).

Figs. 508 and 509. *Bombus fervidus* (Fabricius), male (15 mm) and female (16 mm).

Apinae

151. ***Apis*** Linnaeus: Moderate-sized, apiform [Figs. 506 and 507], black, usually with amber or yellowish areas on metasoma. Characters in couplet 13 alone distinguish *Apis* from all other genera. Abundant; one species, the introduced honeybee, *Apis mellifera* Linnaeus. Ubiquitous, tropics north far into Canada, feral populations to southern Canada. Formerly rare in lowland moist tropical America, but introduction of the African race of *A. mellifera* has resulted in abundance of this species in both tropical and temperate regions (now cosmopolitan; originally palearctic, oriental, and African). Highly eusocial; nests in cavities in trees, in soil, in man-made hives, and so forth; occasionally combs of cells hang in the open. (couplet 13)

Bombinae

152. ***Bombus*** Latreille: Moderate-sized to very large (queens), bombiform [Figs. 508 and 509]; vestiture black, mostly yellow, or usually black with areas of yellow, red, or white. In temperate America none are all black. Common in mesic temperate and especially cool temperate habitats, uncommon or rare in deserts and tropics; 54 species. Arctic, south throughout Canada, U.S.A., Mexico, and on to South America (holarctic and neotropical). Eusocial, in colonies sometimes of hundreds of workers inhabiting hollows in soil, rodent or bird nests, and so forth. Subgenera: Numerous names based on weakly differentiated groups (Richards 1968; Ito 1985; Williams 1985) as follows—*Alpinobombus* Skorikov, *Bombias* Robertson, *Bombus* Latreille s.str., *Brachycephalibombus* Williams, *Crotchiibombus* Franklin, *Cullumanobombus* Vogt, *Dasybombus* Labougle and Ayala, *Fervidobombus* Skorikov, *Fraternobombus* Skorikov, *Pyrobombus* Dalla Torre, *Robustobombus* Skorikov, *Separatobombus* Frison, *Subterraneobombus* Vogt. Revisions: Franklin (1912, 1913); Labougle (1990), Mexican species; Labougle, Ito, and Okazawa (1985), species of Chiapas and Guatemala; Thorp, Horning, and Dunning (1983), California; LaBerge and Webb (1962), Nebraska; Laverty and Harder (1988), eastern Canada; Stephen (1957), western America; Milliron (1971, 1973a,b). (couplet 24)

153. ***Psithyrus*** Lepeletier: Large to very large, similar to black and yellow or rarely wholly black-haired *Bombus;*

females without corbicula, with distal part of metasoma less hairy and more pointed than in *Bombus;* males difficult to distinguish from *Bombus*. Moderately common in mesic temperate areas, elsewhere rare; about eight species. Boreal Canada, U.S.A., south to Guatemala in highlands (holarctic). Social parasites in nests of *Bombus*. Subgenera: Subgeneric taxa are best regarded as species groups. Revisions: Franklin (1912, 1913); Thorp, Horning, and Dunning (1983), California; LaBerge and Webb (1962), Nebraska; Medler and Carney (1963), Wisconsin; Laverty and Harder (1988), eastern Canada. (couplet 24)

Euglossinae

154. ***Aglae*** Lepeletier and Serville: Large, metallic blue, more elongate than other Euglossiniae [Fig. 510]; hind tibia of female slender, straight, without corbicula; scutellum flat, posteriorly truncate. Very rare; one species, *A. caerulea* Lepeletier and Serville. South America north to Panama. (couplet 21)

155. ***Eufriesea*** Cockerell: Large, anthophoriform [Fig. 511], hairy; at least face slightly metallic, one Mexican species has whole body bright green or blue. Rare or uncommon; 20 species. Widespread in American tropics including tropical and subtropical Mexico, north to Chihuahua and San Luis Potosí. Nests of bark and resin in tree, rock, or other cavities. Revision: Kimsey (1982). (couplet 23)

A well-known synonym is *Euplusia* Moure.

156. ***Euglossa*** Latreille: Moderate-sized to large, anthophoriform [Figs. 512 and 513], brilliant metallic green or, less commonly, blue, purple, or coppery; proboscis in repose reaching to or beyond metasoma. Not uncommon; 6 species in Mexico, more than 40 in Central America. Widespread in American tropics, including tropics of Mexico to Tamaulipas and Sonora; also Jamaica. Nests in cavities in banks or trees or constructed of resin on twigs. Subgenera: *Dasystilbe* Dressler, *Euglossa* Latreille s.str., *Euglossella* Moure, *Glossura* Cockerell, *Glossurella* Dressler. Revisions: Moure (1969, 1970); Dressler (1978). (couplet 22)

157. ***Eulaema*** Lepeletier: Large to very large, eucériform [Fig. 514], nonmetallic or metasoma weakly metallic, hairy. Uncommon; 11 species. Widespread in Ameri-

Fig. 510. *Aglae caerulea* Lepeletier and Serville, female (25 mm).

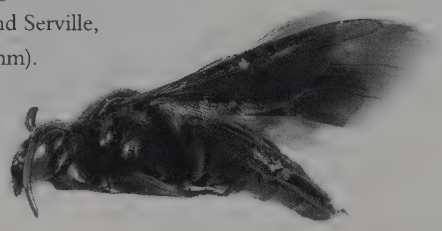


Fig. 511. *Eufriesea surinamensis* (Linnaeus), male (17 mm).

Fig. 512. *Euglossa gorgonensis* Cheesman, male (11 mm).

Fig. 513. *Euglossa dodsoni* Moure, female (10 mm).

Fig. 514. *Eulaema polychroma* (Mocsáry), female (22 mm).

Fig. 515. *Exaerete smaragdina* (Guérin), male (21 mm).

Fig. 516. *Melipona beecheii* Bennett, worker (11 mm).

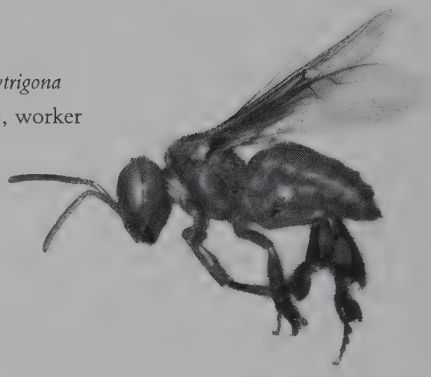


Fig. 517. *Oxytrigona flaveola* (Friese), worker (6 mm).

Fig. 518. *Partamona* sp., worker (7 mm).

Fig. 519. *Trigona clavipes* (Fabricius), worker (7 mm).

can tropics, north through tropical Mexico to Tamaulipas and Sonora, one old record for southernmost Texas. Nests in cavities in banks or trees. Subgenera: *Apeulaema* Moure and *Eulaema* Lepeletier s.str., but see Michener (1990). Revisions: Moure (1963); Dressler (1979). (couplet 23)

158. ***Exaerete*** Hoffmannsegg: Large, euceriform [Fig. 515] but without scopa, uniformly brilliant green or purple. Rare; five species. Widespread in American tropics, in Mexico north to Hidalgo and Nayarit. Cleptoparasites in nests of *Eufriesea* and *Eulaema*. Revisions: Moure (1964); Kimsey (1979). (couplet 21)

Meliponinae

159. ***Cephalotrigona*** Schwarz: Moderate-sized, black or with metasoma red. Uncommon; probably two species. Tropical, ranging north to Tamaulipas. Highly social, in colonies of hundreds or a few thousand; nests in cavities in tree trunks. Revisions: Schwarz (1948, 1949); Ayala (1992). (couplet 6)

160. ***Lestrimelitta*** Friese: Smallish, trigoniform, shiny black, workers (as well as queens) without corbiculae. Uncommon; two species. Widespread in neotropics, including tropical Mexico north to Nayarit. Highly social in large colonies in tree trunk cavities; for food and nest ma-

terials workers rob nests of other Meliponinae and occasionally *Apis;* they do not visit flowers. Revisions: Schwarz (1948, 1949); Ayala (1992). (couplet 2)

161. ***Melipona*** Illiger: Smallish to moderate-sized, body form similar to that of *Apis* [Fig. 516]; coloration similar to that of *Apis* or with yellow integumental bands on metasomal terga, sometimes all black. Uncommon; about 12 species. Widespread in neotropics north to Sinaloa and San Luis Potosí, sometimes attaining high altitudes (e.g., in Morelos), sometimes "domesticated" for honey and wax production; probably introduced to Antilles by pre-Columbian humans. Highly social; nests in cavities, usually in trees. Revisions: Schwarz (1932, 1949); Ayala (1992). (couplet 3)

162. ***Nannotrigona*** Cockerell: Small, blackish, with whitish facial marks. Common; two species. Tropical, ranging north to San Luis Potosí and Sonora. Highly social, in colonies of hundreds; nests in cavities in logs or branches, or in walls. Revisions: Schwarz (1948, 1949). (couplet 11)

163. ***Oxytrigona*** Cockerell: Rather small, partly reddish or yellowish, trigoniform [Fig. 517], with unusually large genal areas. Rare; two or three species. Tropical, ranging north to Chiapas. Highly social in colonies of hundreds; nests in cavities in trunks; defense includes biting extremely irritating material into the skin with the jaws—hence the name "fire bee." Revisions: Schwarz (1948, 1949). (couplet 6)

164. ***Paratrigona*** Schwarz: Small, black with conspicuous yellow markings on face. Rare; four species. Tropical, ranging north to Veracruz. Highly social, in colonies of hundreds; nests exposed or in aerial *Camponotus* nests or in other small cavities. Revision: Schwarz (1948). (couplet 10)

165. ***Partamona*** Schwarz: Moderate-sized, black or testaceous with dull yellow marks along inner orbits, trigoniform [Fig. 518]. Common; three or more species. Tropical, ranging north to Tamaulipas and Nayarit. Highly social, in colonies of thousands; nests sometimes in cavities, usually partly exposed on banks, tree trunks, or buildings. Revisions: Schwarz (1949); Ayala (1992). (couplet 9)

166. ***Plebeia*** Schwarz: Small, black or with metasoma reddish, yellowish marks on face and thorax especially in subgenus *Nogueirapis*. Common; 10 species. Tropical, ranging north to Tamaulipas and Jalisco. Highly social, in colonies of hundreds or a few thousand; nests in cavities in soil or tree trunks or branches, those of the subgenus *Scaura* in nests of *Nasutitermes*. Subgenera: *Nogueirapis* Moure (north to Costa Rica), *Plebeia* Schwarz s.str., *Scaura* Schwarz. Revisions: Schwarz (1949); Ayala (1992). (couplet 9)

The three subgenera of *Plebeia* have often been given generic status. They can be separated by the following key:

a. Hind basitarsus swollen, wider than tibia; mandible edentate; body without yellow or whitish markings ..... *Scaura*

— Hind basitarsus not swollen, narrower than tibia; mandible with two small teeth at upper end of apical margin; face and thorax usually with yellow or whitish markings .....b

b(a). Inner surface of hind tibia of worker with posterior shining margin not or little depressed; body with rich yellow markings including side of thorax, propodeum, and much of face ..... *Nogueirapis*

— Inner surface of hind tibia of worker with posterior shining margin distinctly depressed; body usually black with restricted dull yellow markings but sometimes almost wholly testaceous ..... *Plebeia* s.str.

167. ***Scaptotrigona*** Moure: Moderate-sized, robust, blackish to partly testaceous. Common; seven species. Tropical, ranging north to San Luis Potosí and Sinaloa. Highly social, in colonies of thousands; nests in cavities in tree trunks. Revision: Ayala (1992). (couplet 11)

168. ***Trigona*** Jurine: Small to moderate-sized, black to largely yellowish or with metasoma red, trigoniform [Fig. 519], some species with long, parallel-sided abdomen. Common; about 8 species in Mexico, 15 in Central America. Tropical, ranging north to San Luis Potosí and Sinaloa. Highly social, with colonies of hundreds or thousands, nests in cavities in the soil or in hollow trucks or branches, sometimes in stone walls, in termite nests, or exposed on branches of trees. Subgenera: *Frieseomelitta* Ihering, *Geotrigona* Moure, *Tetragona* Lepeletier and Serville, *Tetragonisca* Moure, *Trigona* Jurine s.str. Revisions: Schwarz (1948, subgenus *Trigona* s.str.; 1949); Ayala (1992). (couplet 7)

The subgenera of *Trigona* are often regarded as genera. Those found in North and Central America can be separated by the following key:

a. Mandible with four or five teeth occupying entire apical margin; inner surface of hind basitarsus of males (and workers) with basal sericeous area without setae ..... *Trigona* s.str.

— Mandible with two small teeth at upper end of otherwise edentate apical margin; inner surface of hind basitarsus of males setose throughout, without basal sericeous area ..... b

b(a). Metasoma short, dorsoventrally flattened, about as wide as thorax; posterior margin of hind tibia of worker usually with few plumose hairs, most of them with only two to six scattered branches not concentrated toward apices; yellow markings absent; vein M of forewing dark almost to wing margin .... *Geotrigona*

— Metasoma usually narrower than thorax, often noticeably elongate; posterior margin of hind tibia of worker with numerous strongly plumose hairs, usually with abundant branches toward apices; yellowish or reddish markings present on face of some species; vein M of forewing frequently fading away near widest part of wing..... c

c(b). Inner surface of hind basitarsus of worker with basal sericeous area lacking setae ..... *Tetragonisca*

— Inner surface of hind basitarsus of worker rather uniformly setose, without basal sericeous area..... d

d(c). First and second segments of labial palpus of worker with long, wavy hairs ..... *Frieseomelitta*

— First and second segments of labial palpus with short (no longer than width of palpus), straight hairs .... *Tetragona*

169. ***Trigonisca*** Moure: Minute (often under 3 mm long), trigoniform. Uncommon; five species. Tropical, ranging north in the tropics to the states of Veracruz and Jalisco. Highly social in colonies of hundreds in small cavities such as old cerambycid beetle burrows in stems or branches. Revisions: Schwarz (1949) as subgenus of *Trigona;* Ayala (1992). (couplet 4)

Classificatory and Nomenclatural Changes

The following is a summary of new or unfamiliar nomenclatural or classificatory changes relevant to North and Central American bees. Those without references are newly introduced here for reasons explained in "Notes on the Genera." Authors' names are given for names that do not appear elsewhere (i.e., in "Notes" or Appendix B).

Old Status	New Status
COLLETIDAE	
Genus *Monidia*	Synonym of *Colletes* (Michener 1989)
ANDRENIDAE	
Andrena, subgenus *Chaulandrena* LaBerge	Synonym of *Dactylandrena* (LaBerge 1986)
Andrena, subgenus *Opandrena* Robertson	Synonym of *Holandrena* (LaBerge 1986)
Genera *Nomadopsis* and *Hypomacrotera*	Subgenera of *Calliopsis* (Ruz 1991)
Genus *Pterosarus*	Subgenus of *Heterosarus*
OXAEIDAE	
Genus *Mesoxaea*	Subgenus of *Protoxaea*
HALICTIDAE	
Genus *Habralictellus*	Subgenus of *Lasioglossum* close to *Dialictus* (G. C. Eickwort, pers. comm. 1991)
Genus *Nomia*	Divided into two genera, *Nomia* and *Dieunomia*

Old Status	New Status
MELITTIDAE	
Genus *Dolichochile*	Subgenus of *Melitta*
Genus *Xeralictoides*	Subgenus of *Hesperapis*
MEGACHILIDAE	
Genus *Adanthidium*	Subgenus of *Dianthidium* (Griswold and Michener 1988)
Genus *Anthocopa*	Group of subgenera of *Hoplitis* (Michener 1968)
Genus *Callanthidium*	Subgenus of *Anthidium* (Griswold and Michener 1988)
Genus *Chalicodoma*	Group of subgenera of *Megachile*
Chalicodoma, subgenus *Carinella* Pasteels 1965:447 (not Johnston 1833 or others)	*Megachile*, subgenus *Carinula* Michener, McGinley and Danforth, **new name**. Type species: *Megachile torrida* Smith (autobasic)
Genus *Chelostomopsis*	Subgenus of *Protosmia* (Griswold 1986b)
Dianthidium, subgenus *Anthidulum*	Subgenus of *Hypanthidiodes* (Griswold and Michener 1988)
Genera *Heteranthidium* and *Ulanthidium*	Subgenera of *Trachusa* (Griswold and Michener 1988)
Genus *Heterostelis*	Synonym of Old World *Protostelis* (Griswold and Michener 1988)
Hypanthidium, subgenus *Saranthidium*	Subgenus of *Hypanthidiodes* (R. W. Brooks and A. Roig-Alsina, pers. comm. 1991)
Genus *Nananthidium*	Subgenus of *Anthodioctes* (Griswold and Michener 1988)
Genus *Odontostelis*	Synonym of *Hoplostelis* (Griswold and Michener 1988)
Paranthidium, subgenus *Mecanthidium*	Subgenus of *Dianthidium* (Griswold and Michener 1988)
Genus *Prochelostoma*	Subgenus of *Chelostoma* (Parker 1988)
Genus *Proteriades*	Subgenus of *Hoplitis* (T. L. Griswold, pers. comm. 1992)
ANTHOPHORIDAE	
Anthophora, subgenus *Micranthophora*	Synonym of subgenus *Heliophila* (Brooks 1988)
Genus *Centrias*	Subgenus of *Nomada*
Genus *Coelioxoides* (not placed in any tribe)	Parasitic genus of Tetrapediini (A. Roig-Alsina 1990)
Genus *Emphoropsis*	Synonym of *Habropoda* (Brooks 1988)
Epeolus bifasciatus Cresson	In subgenus *Trophocleptria*, whose range is thus extended to northern U.S.A. (A. Roig-Alsina, pers. comm. 1991)
Genus *Hypochrotaenia*	Group of subgenera of *Nomada*
Nomada, subgenus *Callinomada*	Synonym of *Nomadita* (Snelling 1986a)
Nomada, subgenera *Gnathias*, *Heminomada*, *Phor*, and *Xanthidium*	Synonyms of *Nomada* s.str. (Snelling 1986a)
Nomada, subgenus *Nomadula*	Synonym of *Nomada* (*Centrias*) (Snelling 1986a)
Genera *Nomadosoma* and *Polybiapis*	Synonyms of *Nomada* (*Hypochrotaenia*) (Snelling 1986a)
Peponapis, subgenera *Eopeponapis* Hurd and Linsley, *Xenopeponapis* Hurd and Linsley, and *Xeropeponapis* Hurd and Linsley	Synonyms of *Peponapis* s.str.
Genus *Protepeolus*	Synonym of *Leiopodus* (A. Roig-Alsina, pers. comm. 1991)
Genus *Xenoglossodes*	Synonym of *Tetraloniella*
APIDAE	
Genus *Trigona*	Divided into several genera (Michener 1990) (see Meliponinae in "Notes")

Appendix A: Classification of Bees of North and Central America

The classification below is based primarily on Hurd (1979). Nomenclatural changes made since then are noted below and are explained in detail in the section "Classificatory and Nomenclatural Changes." The higher classification of the Anthophoridae and Apidae will almost certainly be altered by phylogenetic studies now in progress (see Appendix D).

Colletidae
- Colletinae
  - 1. *Colletes* Latreille (includes *Monidia* Cockerell)
  - 2. *Eulonchopria* Brèthes
- Diphaglossinae
  - Caupolicanini
    - 3. *Caupolicana* Spinola
      - *Alayoapis* Michener
      - *Caupolicana* Spinola s.str.
      - *Zikanapis* Moure
    - 4. *Crawfordapis* Moure
    - 5. *Ptiloglossa* Smith
  - Dissoglottini (= Mydrosomini)
    - 6. *Mydrosoma* Smith (= *Bicornelia* Friese)

Hylaeinae
- 7. *Hylaeus* Fabricius
  - *Cephalylaeus* Michener
  - *Gongyloprosopis* Snelling
  - *Hylaeana* Michener
  - *Hylaeopsis* Michener
  - *Hylaeus* Fabricius s.str.
  - *Metziella* Michener
  - *Paraprosopis* Popov
  - *Prosopella* Snelling
  - *Prosopis* Fabricius
  - *Spatulariella* Popov (introduced in California)

Xeromelissinae (= Chilicolinae)
- 8. *Chilicola* Spinola
  - *Anoediscelis* Toro and Moldenke
  - *Hylaeosoma* Ashmead

Andrenidae
Andreninae
9. *Ancylandrena* Cockerell
10. *Andrena* Fabricius
Anchandrena LaBerge
Andrena Fabricius s.str.
Aporandrena Lanham
Archiandrena LaBerge
Augandrena LaBerge
Belandrena Ribble
Callandrena Cockerell
Celetandrena LaBerge and Hurd
Charitandrena Hedicke
Cnemidandrena Hedicke
Conandrena Viereck
Cremnandrena LaBerge
Dactylandrena Viereck
Dasyandrena LaBerge
Derandrena Ribble
Diandrena Cockerell
Erandrena LaBerge
Eremandrena LaBerge
Euandrena Hedicke
Geissandrena LaBerge and Ribble
Genyandrena LaBerge
Gonandrena Viereck
Hesperandrena Timberlake
Holandrena Pérez
Iomelissa Robertson
Larandrena LaBerge
Leucandrena Hedicke
Melandrena Pérez
Micrandrena Ashmead
Nemandrena LaBerge
Notandrena Pérez
Oligandrena Lanham
Onagrandrena Linsley and MacSwain
Oxyandrena LaBerge
Parandrena Robertson
Pelicandrena LaBerge and Ribble
Plastandrena Hedicke
Psammandrena LaBerge
Ptilandrena Robertson
Rhacandrena LaBerge
Rhaphandrena LaBerge
Scaphandrena Lanham
Scoliandrena Lanham
Scrapteropsis Viereck
Simandrena Pérez
Taeniandrena Hedicke
Thysandrena Lanham
Trachandrena Robertson
Tylandrena LaBerge
Xiphandrena LaBerge
11. *Megandrena* Cockerell
Erythrandrena Zavortink
Megandrena Cockerell s.str.
Panurginae
12. *Anthemurgus* Robertson
13. *Calliopsis* Smith
Calliopsima Shinn
Calliopsis Smith s.str.
Hypomacrotera Cockerell and Porter
Macronomadopsis Rozen
Micronomadopsis Rozen
Nomadopsis Ashmead
Perissander Michener
Verbenapis Cockerell and Atkins
14. *Heterosarus* Robertson
Heterosarus Robertson s.str.
Pterosarus Timberlake
15. *Metapsaenythia* Timberlake
16. *Panurginus* Nylander
17. *Perdita* Smith
Allomacrotera Timberlake
Alloperdita Viereck
Callomacrotera Timberlake
Cockerellia Ashmead
Cockerellula Strand
Epimacrotera Timberlake
Glossoperdita Cockerell
Hesperoperdita Timberlake
Heteroperdita Timberlake
Hexaperdita Timberlake
Macrotera Smith
Macroterella Timberlake
Macroteropsis Ashmead
Pentaperdita Cockerell and Porter
Perdita Smith s.str.
Perditella Cockerell
Procockerellia Timberlake
Pseudomacrotera Timberlake
Pygoperdita Timberlake
Xeromacrotera Timberlake

Xerophasma Cockerell
18. *Protandrena* Cockerell
19. *Pseudopanurgus* Cockerell
20. *Xenopanurgus* Michener

Oxaeidae
21. *Oxaea* Klug
22. *Protoxaea* Cockerell and Porter
Mesoxaea Hurd and Linsley
Protoxaea Cockerell and Porter s.str.

Halictidae
Halictinae
Augochlorini
23. *Augochlora* Smith
Augochlora Smith s.str.
Mycterochlora Eickwort
Oxystoglossella Eickwort
24. *Augochlorella* Sandhouse
25. *Augochloropsis* Cockerell
Augochloropsis Cockerell s.str.
Paraugochloropsis Schrottky
26. *Caenaugochlora* Michener
Caenaugochlora Michener s.str.
Ctenaugochlora Eickwort
27. *Chlerogella* Michener
28. *Megalopta* Smith
Megalopta Smith s.str.
29. *Megommation* Moure
Megaloptina Eickwort (see Appendix C)
30. *Neocorynura* Schrottky
Neocorynura Schrottky s.str.
31. *Pereirapis* Moure
32. *Pseudaugochloropsis* Schrottky
33. *Temnosoma* Smith
Temnosoma Smith s.str.

Halictini
34. *Agapostemon* Guérin-Méneville
35. *Agapostemonoides* Roberts and Brooks
36. *Caenohalictus* Cameron
37. *Dinagapostemon* Moure and Hurd
38. *Habralictus* Moure
39. *Halictus* Latreille
Halictus Latreille s.str.
Seladonia Robertson
40. *Lasioglossum* Curtis
Dialictus Robertson (= *Chloralictus* Robertson)
Evylaeus Robertson
Habralictellus Moure and Hurd
Hemihalictus Cockerell
Lasioglossum Curtis s.str.
Sphecodogastra Ashmead
41. *Mexalictus* Eickwort
42. *Microsphecodes* Eickwort and Stage
43. *Paragapostemon* Vachal
44. *Paralictus* Robertson
45. *Ptilocleptis* Michener
46. *Rhinetula* Friese
47. *Sphecodes* Latreille

Nomiinae
48. *Dieunomia* Cockerell
Dieunomia Cockerell s.str.
Epinomia Ashmead
49. *Nomia* Latreille
Acunomia Cockerell
Curvinomia Michener

Rophitinae (= Dufoureinae)
50. *Conanthalictus* Cockerell
Conanthalictus Cockerell s.str.
Phaceliapis Michener
51. *Dufourea* Lepeletier
Dufourea Lepeletier s.str.
Halictoides Nylander
52. *Michenerula* Bohart
53. *Micralictoides* Timberlake
54. *Protodufourea* Timberlake
55. *Sphecodosoma* Crawford
56. *Xeralictus* Cockerell

Melittidae
Dasypodinae
57. *Hesperapis* Cockerell
Amblyapis Cockerell
Carinapis Stage
Disparapis Stage
Hesperapis Cockerell s.str.
Panurgomia Viereck
Xeralictoides Stage
Zacesta Ashmead

Melittinae
58. *Macropis* Panzer
Macropis Panzer s.str.
59. *Melitta* Kirby
Dolichochile Viereck
Melitta Kirby s.str.

Megachilidae
- Lithurginae
  - 60. *Lithurge* Latreille
    - *Lithurge* Latreille s.str. (introduced in New Jersey)
    - *Lithurgopsis* Fox
- Megachilinae
  - Anthidiini
    - 61. *Anthidiellum* Cockerell
      - *Anthidiellum* Cockerell s.str.
    - 62. *Anthidium* Fabricius (= *Melanthidium* Cockerell)
      - *Anthidium* Fabricius s.str.
      - *Callanthidium* Cockerell
    - 63. *Anthodioctes* Holmberg
      - *Anthodioctes* Holmberg s.str.
      - *Nananthidium* Moure
    - 64. *Aztecanthidium* Michener and Ordway
    - 65. *Dianthidium* Cockerell
      - *Adanthidium* Moure
      - *Deranchanthidium* Griswold and Michener
      - *Dianthidium* Cockerell s.str.
      - *Mecanthidium* Michener
    - 66. *Dolichostelis* Parker and Bohart
    - 67. *Epanthidium* Moure
      - *Carloticola* Moure and Urban
    - 68. *Hoplostelis* Dominique (= *Odontostelis* Cockerell)
    - 69. *Hypanthidiodes* Moure
      - *Anthidulum* Michener
      - *Saranthidium* Moure and Hurd
    - 70. *Hypanthidium* Cockerell
    - 71. *Paranthidium* Cockerell and Cockerell
      - *Paranthidium* Cockerell and Cockerell s.str.
      - *Rapanthidium* Michener
    - 72. *Protostelis* Friese (= *Heterostelis* Timberlake)
    - 73. *Stelis* Panzer
      - *Chelynia* Provancher
      - *Melanostelis* Ashmead
      - *Microstelis* Robertson
      - *Pavostelis* Sladen
      - *Stelidina* Timberlake
      - *Stelidium* Robertson
    - 74. *Trachusa* Panzer
      - *Heteranthidium* Cockerell
      - *Legnanthidium* Griswold and Michener
      - *Trachusomimus* Popov
      - *Ulanthidium* Michener
  - Dioxyini
    - 75. *Dioxys* Lepeletier and Serville
      - *Dioxys* Lepeletier and Serville s.str.
  - Megachilini
    - 76. *Coelioxys* Latrielle
      - *Acrocoelioxys* Mitchell
      - *Boreocoelioxys* Mitchell
      - *Coelioxys* Latreille s.str.
      - *Cyrtocoelioxys* Mitchell
      - *Dasycoelioxys* Mitchell
      - *Glyptocoelioxys* Mitchell
      - *Haplocoelioxys* Mitchell
      - *Melanocoelioxys* Mitchell
      - *Neocoelioxys* Mitchell
      - *Platycoelioxys* Mitchell
      - *Rhinocoelioxys* Mitchell
      - *Schizocoelioxys* Mitchell
      - *Synocoelioxys* Mitchell
      - *Xerocoelioxys* Mitchell
    - 77. *Megachile* Latreille
      - Group 1 (= *Pseudocentron* Mitchell)
        - *Acentron* Mitchell
        - *Leptorachis* Mitchell
        - *Melanosarus* Mitchell
        - *Moureana* Mitchell
        - *Pseudocentron* Mitchell
      - Group 2 (= *Eumegachile* Friese, not in our area)
        - *Grosapis* Mitchell
        - *Sayapis* Titus
      - Group 3 (= *Chalicodoma* Lepeletier, not in our area)
        - *Callomegachile* Michener (introduced into the Antilles)
        - *Carinula* Michener, McGinley and Danforth (introduced into the Antilles)
        - *Chelostomoidella* Snelling (= *Chelostomoides* Robertson?)
        - *Chelostomoides* Robertson
        - *Gronoceras* Cockerell (introduced to Jamaica?)
        - *Pseudomegachile* Friese (introduced into the Antilles and Florida)
      - Group 4 (= *Chrysosarus* Mitchell)
        - *Chrysosarus* Mitchell
      - Group 5 (= *Cressoniella* Mitchell)
        - *Austromegachile* Mitchell
        - *Cressoniella* Mitchell
        - *Holcomegachile* Mitchell

Neomegachile Mitchell
Ptilosaroides Mitchell
Ptilosarus Mitchell
Tylomegachile Moure
Group 6 (= *Megachiloides* Mitchell)
Argyropile Mitchell
Derotropis Mitchell
Megachiloides Mitchell
Phaenosarus Mitchell
Xeromegachile Mitchell
Group 7 (= *Megachile* Latreille)
Addendella Mitchell
Cyphopyga Robertson
Delomegachile Viereck
Eutricharaea Thomson (introduced)
Litomegachile Mitchell
Megachile Latreille s.str.
Xanthosarus Robertson
Osmiini
78. *Ashmeadiella* Cockerell
Arogochila Michener
Ashmeadiella Cockerell s.str. (includes *Titusella* Cockerell)
Chilosima Michener
Cubitognatha Michener
79. *Chelostoma* Latreille
Chelostoma Latreille s.str.
Prochelostoma Robertson
80. *Heriades* Spinola
Neotrypetes Robertson
Physostetha Michener
81. *Hoplitis* Klug
Group 1 (= *Hoplitis* Klug)
Alcidamea Cresson
Andronicus Cresson
Cyrtosmia Michener
Dasyosmia Michener
Formicapis Sladen
Hoplitis Klug s.str. (introduced from Europe to New York State)
Monumetha Cresson (including *Chlorosmia* Sladen)
Robertsonella Titus
Group 2 (= *Anthocopa* Lepeletier and Serville, not in our area)
Atoposmia Cockerell
Eremosmia Michener
Hexosmia Michener
Isosmia Michener and Sokal
Group 3 (= *Proteriades* Titus)
Acrosmia Michener
Cephalapis Cockerell
Hoplitina Cockerell
Penteriades Michener and Sokal
Proteriades Titus
Xerosmia Michener
82. *Osmia* Panzer
Acanthosmioides Ashmead
Centrosmia Robertson
Cephalosmia Sladen
Chalcosmia Schmiedeknecht
Chenosmia Sinha
Diceratosmia Robertson
Euthosmia Sinha
Melanosmia Schmiedeknecht
Monilosmia Robertson
Mystacosmia Snelling
Nothosmia Ashmead
Osmia Panzer s.str.
Trichinosmia Sinha
83. *Protosmia* Ducke
Chelostomopsis Cockerell
84. *Xeroheriades* Griswold

Anthophoridae
Anthophorinae
Anthophorini
85. *Anthophora* Latreille
Anthophoroides Cockerell and Cockerell
Clisodon Patton
Heliophila Klug (= *Micranthophora* Cockerell)
Lophanthophora Brooks
Melea Sandhouse
Mystacanthophora Brooks
Paramegilla Friese
Pyganthophora Brooks
86. *Deltoptila* LaBerge and Michener
87. *Habropoda* Smith (= *Emphoropsis* Ashmead)
Centridini
88. *Centris* Fabricius (= *Hemisia* Klug)
Acritocentris Snelling
Centris Fabricius s.str.
Exallocentris Snelling
Hemisiella Moure
Heterocentris Cockerell

Melanocentris Friese
Paracentris Cameron
Ptilocentris Snelling
Trachina Klug
Xanthemisia Moure
Xerocentris Snelling

89. *Epicharis* Klug
Epicharana Michener
Epicharitides Moure
Epicharoides Radoszkowski
Hoplepicharis Moure
Parepicharis Moure

90. *Ptilotopus* Klug

Emphorini (= Melitomini)

91. *Diadasia* Patton
Coquillettapis Viereck
Dasiapis Cockerell
Diadasia Patton s.str.
Diadasina Moure

92. *Melitoma* Lepeletier and Serville

93. *Ptilothrix* Smith (= *Emphor* Patton)

Ericrocidini (= Ctenioschelini)

94. *Acanthopus* Klug

95. *Aglaomelissa* Snelling and Brooks

96. *Ctenioschelus* Romand

97. *Ericrocis* Cresson

98. *Mesocheira* Lepeletier and Serville

99. *Mesoplia* Lepeletier
Eumelissa Snelling and Brooks
Mesoplia Lepeletier s.str.

Eucerini

100. *Agapanthinus* LaBerge

101. *Anthedonia* Michener

102. *Cemolobus* Robertson

103. *Florilegus* Robertson
Florilegus Robertson s.str.
Floriraptor Moure and Michener

104. *Gaesischia* Michener, LaBerge and Moure
Gaesischiana Michener, LaBerge and Moure
Prodasyhalonia LaBerge

105. *Idiomelissodes* LaBerge

106. *Loxoptilus* LaBerge

107. *Martinapis* Cockerell
Martinapis Cockerell s.str.

108. *Melissodes* Latreille
Apomelissodes LaBerge
Callimelissodes LaBerge
Ecplectica Holmberg
Eumelissodes LaBerge
Heliomelissodes LaBerge
Melissodes Latreille s.str.
Psilomelissodes LaBerge
Tachymelissodes LaBerge

109. *Melissoptila* Holmberg
Ptilomelissa Moure

110. *Pectinapis* LaBerge

111. *Peponapis* Robertson
Peponapis Robertson s.str.

112. *Simanthedon* Zavortink

113. *Svastra* Holmberg
Brachymelissodes LaBerge
Epimelissodes Ashmead

114. *Synhalonia* Patton (often called *Tetralonia* Spinola)

115. *Syntrichalonia* LaBerge

116. *Tetraloniella* Ashmead (= *Xenoglossodes* Ashmead)

117. *Thygater* Holmberg
Nectarodiaeta Holmberg
Thygater Holmberg s.str.

118. *Xenoglossa* Smith
Eoxenoglossa Hurd and Linsley
Xenoglossa Smith s.str.

Exomalopsini

119. *Ancyloscelis* Latreille

120. *Exomalopsis* Spinola
Anthophorisca Michener and Moure
Anthophorula Cockerell
Exomalopsis Spinola s.str.
Megomalopsis Michener and Moure
Panomalopsis Timberlake
Phanomalopsis Michener and Moure

121. *Monoeca* Lepeletier and Serville (= *Fiorentinia* Dalla Torre)

122. *Paratetrapedia* Moure
Lophopedia Michener and Moure
Paratetrapedia Moure s.str.
Xanthopedia Michener and Moure

Melectini

123. *Brachymelecta* Linsley

124. *Melecta* Latreille
Melecta Latreille s.str.
Melectomimus Linsley

125. *Xeromelecta* Linsley
Melectomorpha Linsley
Nesomelecta Michener
Xeromelecta Linsley s.str.

126. *Zacosmia* Ashmead

Osirini
127. *Epeoloides* Giraud
128. *Osiris* Smith
129. *Protosiris* Roig-Alsina
Protepeolini
130. *Leiopodus* Smith (= *Protepeolus* Linsley and Michener)
Rhathymini
131. *Rhathymus* Lepeletier and Serville
Tetrapediini
132. *Coelioxoides* Cresson
133. *Tetrapedia* Klug
Tetrapedia Klug s.str.
Nomadinae
Ammobatini
134. *Oreopasites* Cockerell
Biastini
135. *Neopasites* Ashmead (= *Gnathopasites* Linsley and Michener)
Micropasites Linsley
Neopasites Ashmead s.str.
136. *Rhopalolemma* Roig-Alsina
Epeolini
137. *Epeolus* Latreille
Epeolus Latreille s.str.
Trophocleptria Holmberg
138. *Odyneropsis* Schrottky (= *Parammobates* Friese)
139. *Thalestria* Smith
140. *Triepeolus* Robertson
Holcopasitini
141. *Holcopasites* Ashmead
Holcopasites Ashmead s.str.
Trichopasites Linsley
Neolarrini
142. *Neolarra* Ashmead
Neolarra Ashmead s.str.
Phileremulus Cockerell
Nomadini
143. *Hexepeolus* Linsley and Michener
144. *Melanomada* Cockerell (= *Hesperonomada* Linsley)
145. *Nomada* Scopoli (The synonymy shown below is from Snelling 1986.)
Group 1 (= *Hypochrotaenia* Holmberg)
Aphelonomada Snelling (Cuba)
Hypochrotaenia Holmberg (= *Nomadosoma* Rohwer, *Polybiapis* Cockerell)
Micronomada Cockerell and Atkins (= *Cephen* Robertson)
Group 2 (= *Centrias* Robertson)
Centrias Robertson (= *Nomadula* Cockerell)
Group 3 (= *Nomada* Scopoli)
Asteronomada Broemeling
Holonomada Robertson
Laminomada Rodeck
Nomada Scopoli s.str. (= *Gnathias* Robertson, *Heminomada* Cockerell and Atkins, *Phor* Robertson, and *Xanthidium* Robertson)
Nomadita Mocsáry (= *Callinomada* Rodeck)
Pachynomada Rodeck
Phelonomada Snelling
146. *Paranomada* Linsley and Michener
147. *Triopasites* Linsley
Townsendiellini
148. *Townsendiella* Crawford
Eremopasites Linsley
Townsendiella Crawford s.str.
Xeropasites Linsley
Xylocopinae
Ceratinini
149. *Ceratina* Latreille
Calloceratina Cockerell
Ceratina Latreille s.str. (= *Ceratinula* Moure)
Crewella Cockerell
Euceratina Hirashima (introduced to California)
Zadontomerus Ashmead
Xylocopini
150. *Xylocopa* Latreille
Calloxylocopa Hurd and Moure
Megaxylocopa Hurd and Moure (= *Neoxylocopa* Michener?)
Neoxylocopa Michener
Notoxylocopa Hurd
Schoenherria Lepeletier
Stenoxylocopa Hurd and Moure
Xylocopoides Michener
Apidae
Apinae
151. *Apis* Linnaeus
Bombinae
152. *Bombus* Latreille
Alpinobombus Skorikov
Bombias Robertson
Bombus Latreille s.str.
Brachycephalibombus Williams
Crotchiibombus Franklin

Cullumanobombus Vogt
Dasybombus Labougle and Ayala
Fervidobombus Skorikov
Fraternobombus Skorikov
Pyrobombus Dalla Torre
Robustobombus Skorikov
Separatobombus Frison
Subterraneobombus Vogt

153. *Psithyrus* Lepeletier

Euglossinae

154. *Aglae* Lepeletier and Serville
155. *Eufriesea* Cockerell (= *Euplusia* Moure)
156. *Euglossa* Latreille
Dasystilbe Dressler
Euglossa Latreille s.str.
Euglossella Moure
Glossura Cockerell
Glossurella Dressler
157. *Eulaema* Lepeletier
Apeulaema Moure
Eulaema Lepeletier s.str.
158. *Exaerete* Hoffmannsegg

Meliponinae

159. *Cephalotrigona* Schwarz
160. *Lestrimelitta* Friese
161. *Melipona* Illiger
162. *Nannotrigona* Cockerell
163. *Oxytrigona* Cockerell
164. *Paratrigona* Schwarz
165. *Partamona* Schwarz
166. *Plebeia* Schwarz
Nogueirapis Moure
Plebeia Schwarz s.str.
Scaura Schwarz
167. *Scaptotrigona* Moure
168. *Trigona* Jurine
Frieseomelitta Ihering
Geotrigona Moure
Tetragona Lepeletier and Serville
Tetragonisca Moure
Trigona Jurine s.str.
169. *Trigonisca* Moure

Appendix B: Identification of Figures Used in the Keys

The following list gives the generic and, where available, the specific names of the bees pictured in the uncaptioned illustrations. All drawings in the keys were done by Elaine R. S. Hodges, except as specified or as indicated by initials enclosed in brackets (KM = Kellie Marsh; BND = Bryan N. Danforth; RJM = Ronald J. McGinley). Some figures were redrawn from previously published sources, which are indicated in parentheses. Most wing drawings came from the files at the University of Kansas. Photographs and scanning electron micrographs were made by BND with the help of the Scanning Electron Microscope Laboratory, National Museum of Natural History, and the Smithsonian Office of Printing and Photographic Services. Numbers in parentheses are figure numbers that indicate reuse of the same illustration elsewhere in the keys. The notation "cf." followed by a number refers the reader to related drawings of the same genera or species.

Fig.

22. *Melipona interrupta* Latreille, worker hind tibia (= 39)
23. *Osmia texana* Cresson, female metasoma, lateral view
24. *Nomia melanderi* Cockerell, forewing (= 52)
25. *Megachile chrysopyga* Smith, forewing (= 53, 307, 391)
26. *Lasioglossum malachurum* (Kirby), female hind leg (redrawn from Michener 1978 by Denis Brothers; = 68)
27. *Macropis patellata* Patton, female hind leg (= 116, 346)
28. *Lasioglossum texanum* (Cresson), forewing
29. *Halictus rubicundus* (Christ), female metasomal apex, dorsal view (= 131, 139)
30. *Anthophora pacifica* Cresson, female tarsus (= 205, 329, 368)
31. *Centris smithii* Cresson, male tarsus (= 204, 328, 367)
32. *Melipona fasciata* Latreille, forewing (redrawn from Michener 1990)
33. *Plebeia frontalis* (Friese), forewing (redrawn from Michener 1990)
34. *Trigonisca buyssoni* (Friese), forewing (redrawn from Michener 1990)

35. *Mydrosoma bohartorum* Michener, forewing (redrawn from Michener 1986c) [BND]
36. *Lestrimelitta limao* (Smith), worker face
37. *Melipona interrupta* Latreille, worker face
38. *Lestrimelitta limao* (Smith), worker hind tibia (redrawn from Schwarz 1948)
39. *Melipona interrupta* Latreille, worker hind tibia (= 22)
40. *Trigona amalthea* (Olivier), worker hind tibia, outer surface (redrawn from Michener 1990)
41. *Trigona amalthea* (Olivier), worker hind tibia, inner surface (redrawn from Michener 1990)
42. *Plebeia frontalis* (Friese), worker hind tibia and basitarsus, outer surface (redrawn from Michener 1990)
43. *Plebeia frontalis* (Friese), worker hind tibia and basitarsus, inner surface (redrawn from Michener 1990)
44. *Partamona cupira* (Smith), worker hind tibia and basitarsus, outer surface (redrawn from Michener 1990)
45. *Nannotrigona testaceicornis* (Lepeletier), worker face
46. *Paratrigona opaca* (Cockerell), worker face
47. *Cephalotrigona capitata* (Smith), worker face
48. *Scaptotrigona hellwegeri* (Friese), scuto-scutellar junction, dorsal view
49. *Paratrigona opaca* (Cockerell), scuto-scutellar junction, dorsal view
50. *Nannotrigona testaceicornis* (Lepeletier), scutum, dorsolateral view
51. *Scaptotrigona hellwegeri* (Friese), scutum, dorsolateral view
52. *Nomia melanderi* Cockerell, forewing (= 24)
53. *Megachile chrysopyga* Smith, forewing (= 25, 307, 391)
54. *Apis mellifera* Linnaeus, worker hind leg
55. *Andrena* sp., female hind leg (= 117, 344)
56. *Caupolicana hirsuta* Spinola, forewing (= 64)
57. *Habralictus trinax* (Vachal), forewing
58. *Andrena complexa* Viereck, thorax, lateral view (redrawn from Michener 1944) [BND]
59. *Halictus rubicundus* (Christ), thorax, lateral view (redrawn from Michener 1944) [BND]
60. *Ptiloglossa mexicana* (Cresson), male hind tibia and tibial spur
61. *Ptiloglossa* sp., female hind tarsus
62. *Caupolicana yarrowi* (Cresson), female hind tarsus
63. *Crawfordapis luctuosa* (Smith), forewing
64. *Caupolicana hirsuta* Spinola, forewing (= 56)
65. *Euglossa cordata* (Linnaeus), hind wing
66. *Colletes inaequalis* Say, hind wing (redrawn from Michener 1989)
67. *Bombus impatiens* Cresson, worker hind leg
68. *Lasioglossum malachurum* (Kirby), female hind leg (redrawn from Michener 1978; = 26)
69. *Eulaema fasciata* Lepeletier, male hind leg
70. *Euglossa imperialis* Cockerell, male hind leg
71. *Exaerete frontalis* Cockerell, scutum and scutellum, dorsal view
72. *Exaerete smaragdina* (Guérin), hind femur [KM]
73. *Euglossa cordata* (Linnaeus), male midtibia, outer surface
74. *Eufriesea concava* (Friese), male midtibia, outer surface
75. *Bombus impatiens* Cresson, worker hind leg
76. *Psithyrus fernaldae* Franklin, female hind leg
77. *Bombus fervidus* (Fabricius), male genital capsule, dorsal view (redrawn from Mitchell 1962)
78. *Psithyrus variabilis* (Cresson), male genital capsule, dorsal view (redrawn from Mitchell 1962)
79. *Colletes inaequalis* Say, forewing
80. *Nomada annulata* Smith, forewing (cf. 91, 313, 339)
81. *Colletes americanus* Cresson, female face
82. *Andrena mariae* Robertson, female face (= 111, 343)
83. *Andrena accepta* Viereck, forewing
84. *Dieunomia nevadensis* Cresson, forewing (= 104, 236; cf. 239)
85. *Ceratina cockerelli* H. Smith, forewing (cf. 100) [BND]
86. *Halictus ligatus* Say, forewing (cf. 115, 141)
87. *Synhalonia belfragei* (Cresson), forewing
88. *Protandrena* sp., forewing (= 237)
89. *Melitoma euglossoides* Lepeletier and Serville, forewing
90. *Paratetrapedia calcarata* (Cresson), forewing (= 224)
91. *Nomada annulata* Smith, hind wing (= 313, 339; cf. 80)
92. *Lasioglossum leucozonium* (Schrank), hind wing (cf. 101, 105, 119)
93. *Osiris pallidus* Smith, head and thorax, lateral view
94. *Hexepeolus mojavensis* Linsley and Michener, head and thorax, lateral view
95. *Osiris pallidus* Smith, female metasoma, lateral view
96. *Hexepeolus rhodogyne* Linsley and Michener, female metasoma, dorsal view
97. *Triopasites* sp., female metasoma, dorsal view
98. *Melanomada grindeliae* (Cockerell), head and thorax, lateral view (cf. 342) [BND]
99. *Nomada imbricata* Smith, head and thorax, lateral view (cf. 341) [BND]
100. *Ceratina rupestris* Holmberg, forewing (cf. 85) [BND]
101. *Lasioglossum leucozonium* (Schrank), forewing (= 105, 119; cf. 92)
102. *Ceratina calcarata* Robertson/*dupla* Say, apex of female metasoma (= 234)

103. *Melitta melittoides* (Viereck), apex of female metasoma (= 235, 320)
104. *Dieunomia nevadensis* Cresson, forewing (= 84, 236; cf. 239)
105. *Lasioglossum leucozonium* (Schrank), forewing (= 101, 119; cf. 92)
106. *Augochlora pura* (Say), forewing (= 181; cf. 142)
107. *Xeralictus timberlakei* Cockerell, male midleg and midtibial spur
108. *Augochlorella striata* (Provancher), male midtibial spur
109. *Conanthalictus caerulescens* Timberlake, male face
110. *Sphecodosoma pratti* Crawford, female face
111. *Andrena mariae* Robertson, female face (= 82, 343)
112. *Protodufourea parca* Timberlake, thorax, dorsal view (= 335)
113. *Conanthalictus bakeri* Crawford, thorax, dorsal view (= 336)
114. *Melitta leporina* (Panzer), hind wing
115. *Halictus ligatus* Say, hind wing (cf. 86, 141)
116. *Macropis patellata* Patton, female hind leg (= 27, 346)
117. *Andrena* sp., female hind leg (= 55, 344)
118. *Andrena illinoiensis* Robertson, forewing (= 124)
119. *Lasioglossum leucozonium* (Schrank), forewing (= 101, 105; cf. 92)
120. *Ancylandrena larreae* Timberlake, base of female metasoma, dorsal view
121. *Ancylandrena larreae* Timberlake, base of female metasoma, lateral view
122. *Megandrena enceliae* (Cockerell), base of female metasoma, dorsal view
123. *Megandrena enceliae* (Cockerell), base of female metasoma, lateral view
124. *Andrena illinoiensis* Robertson, forewing (= 118)
125. *Megandrena enceliae* (Cockerell), forewing
126. *Megandrena enceliae* (Cockerell), male genital capsule, dorsal view (redrawn from Michener 1986b)
127. *Andrena helianthi* Robertson, male genital capsule, dorsal view (redrawn from LaBerge 1967)
128. *Megandrena enceliae* (Cockerell), male mandible
129. *Ancylandrena larreae* Timberlake, male mandible
130. *Augochlora pura* (Say), apex of female metasoma (= 140)
131. *Halictus rubicundus* (Christ), apex of female metasoma (= 29, 139)
132. *Temnosoma* sp., male metasoma, lateral view (= 176)
133. *Lasioglossum quebecencis* (Crawford), detail of female forewing (= 143)
134. *Halictus rubicundus* (Christ), detail of female forewing (= 145)
135. *Ptilocleptis tomentosa* Michener, female face
136. *Sphecodes carolinus* Mitchell, female face (= 327)
137. *Microsphecodes truncaticaudus* Michener, forewing
138. *Sphecodes gibbus* (Linnaeus), forewing
139. *Halictus rubicundus* (Christ), apex of female metasoma (= 29, 131)
140. *Augochlora pura* (Say), apex of female metasoma (= 130)
141. *Halictus ligatus* Say, detail of female forewing (cf. 86, 115) [BND]
142. *Augochlora pura* (Say), detail of female forewing (cf. 106, 181) [BND]
143. *Lasioglossum quebecencis* (Crawford), detail of female forewing (= 133)
144. *Lasioglossum sisymbrii* (Cockerell), detail of female forewing
145. *Halictus rubicundus* (Christ), detail of female forewing (= 134)
146. *Lasioglossum coriaceum* (Smith), female metasoma, dorsal view
147. *Halictus rubicundus* (Christ), female metasoma, dorsal view (cf. 29, 131, 139)
148. *Sphecodes monilicornis* (Kirby), male propodeum
149. *Halictus rubicundus* (Christ), male propodeum
150. *Lasioglossum zonulum* Smith, male propodeum
151. *Sphecodes monilicornis* (Kirby), male scutum, tegulae above and below, head to left
152. *Halictus rubicundus* (Christ), male scutum, tegulae above and below, head to left
153. *Mexalictus micheneri* Eickwort, female inner hind tibial spur (redrawn from Eickwort 1978)
154. *Neocorynura* sp., female hind tibial spurs (= 162, 178)
155. *Mexalictus* sp., male antenna
156. *Lasioglossum* sp., male antenna
157. *Paralictus* sp., male face
158. *Lasioglossum* (*Evylaeus*) sp., male face (= 326, 332)
159. *Rhinetula denticrus* Friese, female metasoma, lateral view [BND]
160. *Dinagapostemon sicheli* (Vachal), female metasoma, lateral view [BND]
161. *Caenohalictus opaciceps* (Friese), female hind tibial spurs
162. *Neocorynura* sp., female hind tibial spurs (= 154, 178)
163. *Caenohalictus opaciceps* (Friese), thorax, lateral view [BND]
164. *Paragapostemon coelestinus* (Westwood), thorax, lateral view [BND]
165. *Paragapostemon coelestinus* (Westwood), male metasoma, lateral view [BND]
166. *Rhinetula denticrus* Friese, male propodeum, lateral view
167. *Agapostemonoides hurdi* Roberts and Brooks, male hind tarsus
168. *Dinagapostemon sicheli* (Vachal), male hind femur

169. *Agapostemon radiatus* (Say), propodeum, posterior view
170. *Neocorynura* sp., male petiole, dorsal view
171. *Megalopta* sp., female face
172. *Augochloropsis metallica* (Fabricius), tegula
173. *Augochlora pura* (Say), tegula
174. *Augochloropsis metallica* (Fabricius), female basitibial plate [KM]
175. *Augochlora pura* (Say), female basitibial plate [KM]
176. *Temnosoma* sp., male metasoma, lateral view (= 132)
177. *Augochlorella striata* (Provancher), female hind tibial spurs (= 183)
178. *Neocorynura* sp., female hind tibial spurs (= 154, 162)
179. *Augochlora pura* (Say), female face
180. *Lasioglossum sisymbrii* (Cockerell), female face
181. *Augochlora pura* (Say), forewing (= 106; cf. 142)
182. *Pereirapis* sp., female hind tibial spurs
183. *Augochlorella striata* (Provancher), female hind tibial spurs (= 177)
184. *Chlerogella elongaticeps* Michener, female face (redrawn from Michener 1954a) [BND]
185. *Pseudaugochloropsis graminea* (Fabricius), female face
186. *Pseudaugochloropsis graminea* (Fabricius), male metasoma, ventral view
187. *Pseudaugochloropsis graminea* (Fabricius), male antenna
188. *Pereirapis* sp., male metasoma, ventral view
189. *Augochlorella persimilis* (Viereck), male metasoma, ventral view
190. *Perdita novaeangliae* Viereck, forewing
191. *Xylocopa tabaniformis* Smith, forewing
192. *Protoxaea gloriosa* (Fox), forewing
193. *Mesoplia rufipes* (Perty), forewing
194. *Ericrocis pintada* Snelling and Zavortink, female midleg and midtibial spur
195. *Mesocheira bicolor* (Fabricius), female midtibial spur
196. *Thygater dispar* (Smith), midtibial spur
197. *Mesoplia imperatrix* (Friese), metasoma, lateral view [KM]
198. *Mesocheira bicolor* (Fabricius), metasoma, lateral view [KM]
199. *Mesoplia azurea* (Lepeletier and Serville), basitarsus of midleg (redrawn from Snelling and Brooks 1985) [KM]
200. *Mesocheira bicolor* (Fabricius), scutellum, dorsal view
201. *Ctenioschelus goryi* (Romand), male, dorsal view
202. *Aglaomelissa duckei* (Friese), female thorax, anterolateral view
203. *Coelioxoides punctipennis* Cresson, female metasoma, dorsal view
204. *Centris smithii* Cresson, tarsus (= 31, 328, 367)
205. *Anthophora pacifica* Cresson, tarsus (= 30, 329, 368)
206. *Tetrapedia peckoltii* Friese, male midtibial spur
207. *Zacosmia maculata* (Cresson), male antenna
208. *Zacosmia maculata* (Cresson), forewing (= 351)
209. *Ptilothrix fructifer* (Holmberg), forewing
210. *Epicharis elegans* Smith, forewing
211. *Centris poecila* Lepeletier, forewing
212. *Epicharis flava* Friese, male head, dorsal view
213. *Centris nitida* Smith, female basitibial plate [KM]
214. *Triepeolus* sp., thorax, lateral view
215. *Anthophora* sp., thorax, lateral view
216. *Melecta pacifica* Cresson, thorax, dorsal view
217. *Triepeolus texanus* (Cresson), head and thorax, dorsal view (= 319)
218. *Odyneropsis* sp., forewing
219. *Epeolus cruciger* (Panzer), forewing
220. *Triepeolus texanus* (Cresson), female pygidium
221. *Epeolus compactus* Cresson, female pygidium
222. *Triepeolus concavus* (Cresson), female S6 (redrawn from Linsley and Michener 1939)
223. *Epeolus* (*Trophocleptria*) sp., female S6 (drawing courtesy of Arturo Roig-Alsina)
224. *Paratetrapedia calcarata* (Cresson), forewing (= 90)
225. *Xeromelecta californica* (Cresson), forewing
226. *Xeromelecta californica* (Cresson), female tarsal claw, lateral view (redrawn from Linsley 1939) [KM]
227. *Melecta callura* Cockerell, female tarsal claw, lateral view (redrawn from Linsley 1939) [KM]
228. *Xeromelecta californica* (Cresson), forewing surface
229. *Paratetrapedia lugubris* (Cresson), forewing surface
230. *Anthophora cockerelli* Timberlake, forewing
231. *Deltoptila montezumia* (Smith), forewing (cf. 232)
232. *Deltoptila montezumia* (Smith), hind wing (cf. 231)
233. *Habropoda* sp., hind wing
234. *Ceratina calcarata* Robertson/*dupla* Say, apex of female metasoma (= 102)
235. *Melitta melittoides* (Viereck), apex of female metasoma (= 103, 320)
236. *Dieunomia nevadensis* Cresson, forewing (= 84, 104; cf. 239)
237. *Protandrena* sp., forewing (= 88)
238. *Leiopodus lacertinus* Smith, forewing
239. *Dieunomia nevadensis* Cresson, hind wing (cf. 84, 104, 236)
240. *Diadasia afflicta* (Cresson), forewing (cf. 246)
241. *Exomalopsis zexmeniae* Cockerell, forewing (cf. 349, 354)
242. *Exomalopsis solani* Cockerell, female face
243. *Paratetrapedia* sp., female face
244. *Monoeca lanei* (Moure), female fore basitarsus
245. *Paratetrapedia lugubris* (Cresson), female fore basitarsus

246. *Diadasia afflicta* (Cresson), hind wing (cf. 240)
247. *Ancyloscelis panamensis* Michener, hind wing
248. *Melissodes agilis* Cresson, hind wing (cf. 289)
249. *Diadasia sphaeralcearum* Cockerell, female face
250. *Melissodes lupina* Cresson, female face
251. *Ancyloscelis toluca* (Cresson), male hind leg
252. *Synhalonia atriventris* (Smith), female hind basitarsus
253. *Thygater* sp., female metasoma, ventral view
254. *Peponapis* sp., female metasoma, ventral view
255. *Thygater* sp., female mandible
256. *Peponapis* sp., female mandible
257. *Cemolobus ipomoeae* (Robertson), male face (= 286)
258. *Xenoglossa strenua* (Cresson), female face
259. *Peponapis pruinosa* (Say), female face
260. *Peponapis pruinosa* (Say), female hind basitarsus
261. *Melissodes desponsa* Smith, female hind basitarsus
262. *Melissodes* sp., tegula (= 290)
263. *Synhalonia atriventris* (Smith), tegula (= 291)
264. *Melissodes agilis* Cresson, female mandible [BND]
265. *Martinapis luteicornis* (Cockerell), female mandible [BND]
266. *Florilegus condignus* (Cresson), apex of female antenna
267. *Martinapis luteicornis* (Cockerell), apex of female antenna
268. *Pectinapis* sp., female face
269. *Svastra obliqua* (Say), female metasomal base, dorsal view (= 299)
270. *Loxoptilus longifellator* LaBerge, female head (cf. 300)
271. *Tetraloniella albata* (Cresson), male head (= 301)
272. *Synhalonia lepida* (Cresson), female pygidium pulled out to expose plate fully
273. *Simanthedon linsleyi* Zavortink, female pygidium pulled out to expose plate fully
274. *Gaesischia exul* Michener, LaBerge and Moure, female face [BND]
275. *Tetraloniella albata* (Cresson), female face [BND]
276. *Gaesischia flavoclypeata* Michener, LaBerge and Moure, female forecoxa and trochanter, inner surface (redrawn from Urban 1968a) [BND]
277. *Syntrichalonia exquisita* (Cresson), female vertex
278. *Florilegus condignus* (Cresson), female vertex
279. *Melissoptila pinguis* (Cresson), forewing (= 288)
280. *Idiomelissodes duplocincta* (Cockerell), forewing
281. *Melissoptila* sp., female middle and hind coxae
282. *Idiomelissodes* sp., female midtibial spur
283. *Florilegus condignus* (Cresson), female basitibial plate
284. *Tetraloniella albata* (Cresson), female basitibial plate
285. *Thygater analis* (Lepeletier), male head
286. *Cemolobus ipomoeae* (Robertson), male face (= 257)
287. *Florilegus condignus* (Cresson), male S6, ventral view
288. *Melissoptila pinguis* (Cresson), forewing (= 279)
289. *Melissodes agilis* Cresson, forewing (cf. 248)
290. *Melissodes* sp., tegula (= 262)
291. *Synhalonia atriventris* (Smith), tegula (= 263)
292. *Xenoglossa kansensis* Cockerell, male antennal base
293. *Martinapis luteicornis* (Cockerell), male antennal base
294. *Martinapis luteicornis* (Cockerell), male antennal apex
295. *Gaesischia exul* Michener, LaBerge and Moure, male antennal base and apex
296. *Simanthedon linsleyi* Zavortink, male head
297. *Syntrichalonia exquisita* (Cresson), base of male metasoma, ventral view
298. *Idiomelissodes duplocincta* (Cockerell), male S5 and S6
299. *Svastra obliqua* (Say), female metasomal base, dorsal view (= 269)
300. *Loxoptilus longifellator* LaBerge, male head (cf. 270)
301. *Tetraloniella albata* (Cresson), male head (= 271)
302. *Synhalonia atriventris* (Smith), male head
303. *Pectinapis* sp., male head
304. *Peponapis pruinosa* (Say), male S6, ventral view
305. *Synhalonia atriventris* (Smith), male S6, ventral view
306. *Perdita bishoppi planorum* Timberlake, forewing (cf. 309)
307. *Megachile chrysopyga* Smith, forewing (= 25, 53, 391)
308. *Neolarra* sp., hind wing
309. *Perdita bishoppi planorum* Timberlake, hind wing (cf. 306)
310. *Holcopasites heliopsis* (Robertson), forewing (= 316)
311. *Dioxys productus subruber* (Cockerell), forewing
312. *Chilicola ashmeadi* (Crawford), hind wing [BND]
313. *Nomada annulata* Smith, hind wing (= 91, 339; cf. 80)
314. *Hylaeus ellipticus* (Kirby), female head, anterolateral view
315. *Nomada* (*Hypochrotaenia*) sp., forewing [RJM]
316. *Holcopasites heliopsis* (Robertson), female forewing (= 310)
317. *Holcopasites arizonicus* (Linsley), female face
318. *Townsendiella* sp., male face
319. *Triepeolus texanus* (Cresson), dorsal view, head and thorax (= 217)
320. *Melitta melittoides* (Viereck), apex of female metasoma (= 103, 235)
321. *Coelioxys* sp., face
322. *Dioxys productus cismontanicus* Hurd, metanotum, lateral view
323. *Lasioglossum lustrans* (Cockerell), forewing [BND]
324. *Dufourea marginata* (Cresson), forewing (= 333)
325. *Sphecodes wheeleri* Mitchell, forewing [BND]
326. *Lasioglossum* (*Evylaeus*) sp., male face (= 158, 332)

327. *Sphecodes carolinus* Mitchell, female face (= 136)
328. *Centris smithii* Cresson, tarsus (= 31, 204, 367)
329. *Anthophora pacifica* Cresson, tarsus (= 30, 205, 368)
330. *Chelostoma californicum* Cresson, male face [BND]
331. *Dufourea calochorti* (Cockerell), female face (= 337)
332. *Lasioglossum* (*Evylaeus*) sp., male face (= 158, 326)
333. *Dufourea marginata* (Cresson), forewing (= 324)
334. *Micralictoides altadenae* (Michener), forewing
335. *Protodufourea parca* Timberlake, thorax, dorsal view (= 112)
336. *Conanthalictus bakeri* Crawford, thorax, dorsal view (= 113)
337. *Dufourea marginata* (Cresson), female face (= 331)
338. *Michenerula beameri* Bohart, female face
339. *Nomada annulata* Smith, hind wing (= 91, 313; cf. 80)
340. *Heterosarus neomexicanus* (Cockerell), hind wing (= 350)
341. *Nomada imbricata* Smith, mandibular articulation (cf. 99)
342. *Melanomada grindeliae* (Cockerell), mandibular articulation (cf. 98) [BND]
343. *Andrena mariae* Robertson, female face (= 82, 111)
344. *Andrena* sp., female hind leg (= 55, 117)
345. *Hesperapis arida* Michener, female hind leg
346. *Macropis patellata* Patton, female hind leg (= 27, 116)
347. *Lithurge littoralis* (Cockerell), mandible
348. *Lithurge apicalis* (Cresson), hind tibia
349. *Exomalopsis zexmeniae* Cockerell, hind wing (= 354; cf. 241)
350. *Heterosarus neomexicanus* (Cockerell), hind wing (= 340)
351. *Zacosmia maculata* (Cresson), forewing (= 208)
352. *Exomalopsis compactula* (Cockerell), forewing
353. *Neopasites* sp., forewing
354. *Exomalopsis zexmeniae* Cockerell, hind wing (= 349; cf. 241)
355. *Oreopasites* sp., hind wing
356. *Neopasites* sp., face
357. *Stelis rubi* Cockerell, face
358. *Neopasites* sp., scape
359. *Townsendiella* sp., scape
360. *Townsendiella californica* Michener, forewing (redrawn from Linsley and Michener 1939)
361. *Rhopalolemma robertsi* Roig-Alsina, forewing (drawing courtesy of Arturo Roig-Alsina)
362. *Stelis rubi* Cockerell, male midtibia
363. *Anthidium maculosum* Cresson, male midtibia
364. *Protostelis australis* (Cresson), hind leg
365. *Stelis rubi* Cockerell, hind tibia
366. *Dolichostelis rudbeckiarum* (Cockerell), propodeum
367. *Centris smithii* Cresson, tarsus (= 31, 204, 328)
368. *Anthophora pacifica* Cresson, tarsus (= 30, 205, 329)
369. *Anthidium illustre* Cresson, propodeum
370. *Dianthidium ulkei* (Cresson), propodeum
371. *Anthidium maculosum* Cresson, female mandible
372. *Hypanthidium toboganum* (Cockerell), female mandible
373. *Dianthidium ulkei* (Cresson), head and thorax, lateral view
374. *Hypanthidium toboganum* (Cockerell), head and thorax, lateral view
375. *Dianthidium chamelae* Griswold and Michener, female mandible
376. *Hypanthidiodes currani* (Schwarz), male face
377. *Hypanthidiodes* sp., apex of male metasoma
378. *Anthidiellum notatum* (Latreille), thorax, dorsal view
379. *Anthidiellum notatum* (Latreille), thorax, lateral view
380. *Dianthidium curvatum sayi* Cockerell, thorax, dorsal view
381. *Dianthidium curvatum sayi* Cockerell, thorax, lateral view
382. *Anthidiellum notatum robertsoni* (Cockerell), male face [BND]
383. *Paranthidium jugatorium perpictum* (Cockerell), female midtibia, outer view [BND]
384. *Dianthidium curvatum* (Smith), female midtibia, outer view [BND]
385. *Anthodioctes* sp., propodeum, posterolateral view
386. *Aztecanthidium tenochtitlanicum* Snelling, female T6, dorsal view
387. *Aztecanthidium tenochtitlanicum* Snelling, male T5–T7, dorsal view
388. *Anthodioctes* sp., dorsum of thorax
389. *Hypanthidiodes currani* (Schwarz), dorsum of thorax
390. *Trachusa gummifera* Thorp, forewing
391. *Megachile chrysopyga* Smith, forewing (= 25, 53, 307)
392. *Heriades variolosa* (Cresson), metanotum and propodeum, dorsal view
393. *Osmia* sp., thorax, dorsal view
394. *Hoplitis* sp., thorax, dorsal view
395. *Protosmia rubifloris* (Cockerell), hind coxae, ventral view [BND]
396. *Protosmia rubifloris* (Cockerell), female face
397. *Ashmeadiella occipitalis* Michener, head and thorax, anterolateral view
398. *Ashmeadiella californica* (Ashmead), male T5 and T6, dorsal view
399. *Calliopsis andreniformis* Smith, head, frontal view [BND]
400. *Panurginus occidentalis* (Crawford), head, frontal view [BND]
401. *Calliopsis andreniformis* Smith, male metasoma, ventral view (redrawn from Ruz 1991) [BND]
402. *Panurginus occidentalis* (Crawford), head and thorax
403. *Heterosarus neomexicanus* (Cockerell), head and thorax
404. *Panurginus occidentalis* (Crawford), forewing

405. *Calliopsis andreniformis* Smith, forewing
406. *Metapsaenythia abdominalis* (Cresson), propodeum
407. *Pseudopanurgus fraterculus* Timberlake, propodeum
408. *Anthemurgus passiflorae* Robertson, propodeum
409. *Pseudopanurgus crenulatus* (Cockerell), forecoxa
410. *Heterosarus bakeri* (Cockerell), male hind tibia
411. *Andrena erythrogaster* (Ashmead), maxilla, inner surface (redrawn from Michener 1985a)
412. *Halictus quadricinctus* (Fabricius), maxilla, inner surface (redrawn from Michener 1985a)
413. *Oxaea flavescens* Klug, maxilla, inner surface (redrawn from Michener 1985a)
414. *Ericrocis lata* (Cresson), labium, lateral view (redrawn from Snelling and Brooks 1985)
415. *Ericrocis lata* (Cresson), base of labium and cardines, ventral view (redrawn from Snelling and Brooks 1985)
416. *Pseudaugochloropsis graminea* (Fabricius), proboscis, lateral view (redrawn from Eickwort 1969)

Appendix C: A Genus Recently Recognized in Our Area

Megommation Moure. Presumably unnamed species of this genus of augochlorine halictids have now been recognized from Panama and Costa Rica; indeed Eickwort (1969) reported the genus from Costa Rica. T. L. Griswold kindly lent specimens for study. The female runs to couplet 84 and agrees best with *Pseudaugochloropsis* but lacks the ridge behind the ocelli. The male runs to couplet 85; if the sublateral rows of coarse setae on S4 are not regarded as "patches," it runs to *Augochlorella*. Both sexes differ from all other North and Central American halictids by the narrow proboscis and narrow proboscidial fossa, about half as wide as the labrum and much narrower than the anterior femur. In coloration and appearance they resemble small *Megalopta* or are entirely dark with green reflections. Rare; three species, including the parasitic one mentioned below. Humid and mesic areas, southern Brazil to Costa Rica. Our species belong to the subgenus *Megaloptina* Eickwort.

A presumably parasitic species of *Megommation* also occurs in Costa Rica. Lacking a strong scopa, its female runs to 51 in the key. It differs from *Paralictus* by strong apical venation and from *Sphecodes* and its relatives by metallic coloration. The mandible of the female is very large and pointed, and the inner hind tibial spur is minutely ciliate like the outer spur. It is the custom to put such parasitic forms in separate genera.

Appendix D: Anticipated Classificatory Changes

As indicated in the Introduction, one of us (CDM) is involved in a study of bee phylogeny and classification. We have not used the preliminary results of this study in preparation of the present work. However, the phylogenetic study of long-tongued bees, under the authorship of A. Roig-Alsina and C. D. Michener, is near completion.* Some of the conclusions are as follows:

Only two families of long-tongued bees can be recognized: Megachilidae and Apidae. Thus, as Michener believed in 1944, the Anthophoridae should be included in the Apidae.

The subfamilies of Apidae recognized are Nomadinae, Xylocopinae, and Apinae. The tribes Osirini, Protepeolini, and Isepeolini (the last not found in North and Central America) are part of the Apinae, not part of the Nomadinae.

Within the Nomadinae, separate new tribes are proposed for *Hexepeolus* and for the *Brachynomada* group, including the North American genera *Melanomada, Triopasites,* and *Paranomada.*

The tribes Euglossini, Bombini, Apini, and Meliponini form a distinctive clade often called the family Apidae, but it arises from within the subfamily Apinae. Relatives of this clade are probably the tribes Centridini and Anthophorini, not the Xylocopinae.

The Exomalopsini is dismembered, forming the tribes Exomalopsini in a restricted sense and Tapinotaspini (including *Paratetrapedia*). The genus *Ancyloscelis* is removed from the Exomalopsini and joins the Emphorini as a subtribe.

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* *Note added in proof:* The work cited above (Roig-Alsina and Michener 1993) and an accompanying paper on phylogeny of certain Anthophorinae (Silveira 1993) have now been published. In one sense it is unfortunate that the publication process for this book has resulted in its appearance after the classification used is already superseded. In another sense, however, it is appropriate to use the widely accepted old classification in a general work of this sort while awaiting the response of hymenopterists to the classificatory novelties proposed by Roig-Alsina and Michener.—CDM

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Supergeneric names are set in capital letters, valid names are set in roman type, and synonyms are set in italic type. Page numbers are set in roman type, boldface numbers are the couplet numbers where genera key out in "Key to the Genera," and italic numbers are the figure numbers of illustrations.

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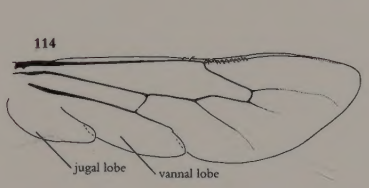
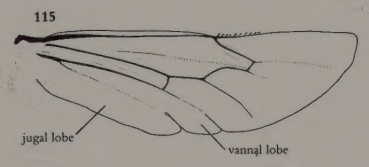
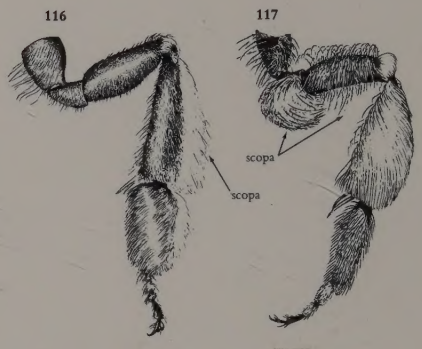






41(38). Jugal lobe of hind wing about half as long as vannal lobe measured from wing base [Fig. 114]; scopa of female on hind tibia, not on basal segments of leg [as in Fig. 116] (Melittidae, Melittinae, part) (rare) ..... *Melitta* [59]

— Jugal lobe of hind wing long, much more than half as long as vannal lobe [Fig. 115]; scopa of female (except in parasitic genera that lack the scopa) well developed on hind femur and sometimes trochanter [Fig. 117] 42

42(41). Basal vein (first abscissa of M) straight or feebly arcuate [Fig. 118]; facial foveae present in female and covered with short velvety hairs [Fig. 111] (Andrenidae, Andreninae, part) 43

— Basal vein strongly arcuate or subangulate near base [Fig. 119]; facial foveae absent (Halictidae, Halictinae, part) 48

43(42). Females 44

— Males 46

41(38). Lóbulo yugal del ala posterior aproximadamente la mitad del largo del lóbulo vanal medido desde la base del ala [Fig. 114]; hembra con escopa en la tibia posterior, pero no en los segmentos basales de la pata [como en Fig. 116] (Melittidae, Melittinae, parte) (raro) ..... *Melitta* [59]

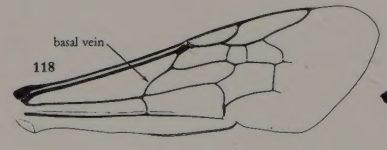
— Lóbulo yugal del ala posterior largo, mucho más de la mitad del largo del lóbulo vanal [Fig. 115]; hembra con escopa (excepto en los géneros parásitos que carecen de escopa) bien desarrollada en el fêmur posterior y a veces también en el trocánter [Fig. 117] 42

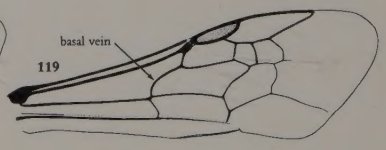
42(41). Vena basal (primera abscisa de M) recta o débilmente arqueada [Fig. 118]; hembra con fóveas faciales cubiertas por una corta pubescencia aterciopelada [Fig. 111] (Andrenidae, Andreninae, parte) 43

— Vena basal fuertemente arqueada o subangulosa cerca de la base [Fig. 119]; fóveas faciales ausentes (Halictidae, Halictinae, parte) 48

43(42). Hembras 44

— Machos 46





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